

AN EVALUATION OF THE SYSTEMS ACQUISITION
MANAGEMENT CURRICULUM

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NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

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Management Curriculum

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ABSTRACT

The Systems Acquisition Management Curriculum offered by the Naval Postgraduate School is the first attempt by the Navy to provide naval officers with a graduate education in the fundamentals of systems acquisition. The methodology of design and development of this curriculum is described and analyzed. In the evaluation of this curriculum, alternative models are developed which provide the basis for continued curriculum improvement.

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I. INTRODUCTION

A. BACKGROUND

At the direction of the Chief of Naval Personnel, the Systems Acquisition Management (SAM) Curriculum was established at the Naval Postgraduate School in September 1971 under the sponsorship of the Chief of Naval Material. It is designed to provide selected officers with an advanced education in the fundamental concepts, methodology, and analytical techniques for the life cycle management of the planning and acquisition of defense systems and leads to a Master of Science degree in Management.

Today's weapons are highly complex, technically sophisticated defense systems not even dreamed of a generation ago. Since technology does not remain static, it is axiomatic that even more complex systems will be developed in the future. It is necessary then that acquisition management techniques be utilized to guide these systems throughout their programmed life cycle. Since the early 1960's, the primary means for doing this has been project management. Under this concept, the Project Manager provides centralized control over all technical and business aspects of the program and is responsible for the development and production of a system that meets cost, schedule, and performance criteria established by the appropriate service and approved by the Secretary of Defense. To date, the military services

have been unable to satisfactorily meet program objectives in the acquisition of numerous defense systems.

According to the General Accounting Office, 32 major weapon systems currently under various stages of development and production for the Navy were originally estimated to cost \$31.5 billion. These same systems are now expected to cost more than \$56.3 billion. Cost growth for ship acquisition is the highest of any single type of system and has been averaging about 113% in recent years. Schedule slippages from a sample of fifty systems throughout the Department of Defense have averaged 33% over the original planning target estimate.¹ Performance specifications have not been met in all cases due to state-of-the-art technology and cost-benefit trade-offs associated with new developmental programs. Indeed, Senator William Proxmire, after conducting lengthy hearings on the acquisition of weapon systems in his role as Chairman of the Subcommittee on Economy in Government, concluded that "one could search in vain for a weapon that was produced on time, worked according to specifications, and did not exceed the estimated cost."² The news media and the public as well have voiced their disapproval of the manner in

¹"Acquisition of Major Weapon Systems," Report to Congress by the Comptroller General of the United States, B-163058, March 18, 1971.

²Proxmire, William, Report from Wasteland, New York, Praeger Publishers, 1970, p. 75.

which weapons systems have been acquired and the upward spiraling costs for continued support of the war in Vietnam act as a catalytic force for continuing criticism of defense systems acquisitions.

Under the Nixon Administration, policy changes have been made which impact heavily on the decision-making processes in the development and production of future defense systems. Deputy Secretary of Defense David Packard addressed one specific problem in May 1970 when he stressed the "imperative" need for the services to do a better job of project management. Better project management requires better Project Managers--better educated and better trained to meet the exacting demands of public trust.

B. PROPOSED SOLUTIONS

Several solutions have been proposed to meet the Navy's needs for better trained and better educated officers assigned to acquisition management positions. One of the proposals is to send prospective system acquisition managers to the Defense Systems Management School, Fort Belvoir, Virginia, for the five-month course in Systems Management. The primary objective of this course is to provide selected officers and key civilian personnel with a graduate level course which simulates on-the-job training in the basic fundamentals of project management. This course which has been revised and upgraded from a ten-week course conducted at the former Defense Weapons System Management Center, Wright-Patterson Air Force

Base, commenced operation in August 1971. The method of instruction concentrates on immersing the student in intensive participative study designed to bring out the essential nature of "real world" problem-solving in the defense systems acquisition environment. Through case studies, lectures, and a comprehensive computer-assisted exercise simulating the entire life cycle of a major system, the student is provided with the necessary tools to evaluate both the quantitative and qualitative factors associated with defense systems acquisition problems and make proper judgments on the basis of sound alternatives.³

A second solution for more experienced officers and civilians entering or returning to project management is the Weapon System Acquisition Management Baseline Course offered by the Navy Logistics Management School in Washington, D. C. This course provides indoctrination for Project Managers, Office of the Chief of Naval Operations Program Sponsors, their deputies and other selected senior military and civilian personnel in the latest philosophy, policies, and practices relating to project management. It is scheduled four times a year, and is designed to accommodate six to 15 students per class. The course length is ten days, and lectures, seminars and review of cases are employed as the principal

³"Proposed Defense Systems Management Center Five-Month Course Outline," Prepared by the DSMC Policy Guidance Council Curriculum Committee, 29 January 1971.

methods of instruction. Instructors are senior military and civilian personnel from the Navy Department, Department of Defense, General Accounting Office, and others who have current operating experience in the area of systems acquisition.

The third solution, which offers a program structured to meet the educational and career development needs of future Navy Project Managers, is the Systems Acquisition Management Curriculum at the Naval Postgraduate School. This curriculum, developed through application of the systems approach to curriculum design, can provide the systems acquisition management education required by the Navy Project Manager. It is the purpose of this thesis to:

- (1) Describe the curriculum design methodology and development of the curriculum.
- (2) Evaluate the current curriculum.
- (3) Develop and evaluate additional curriculum alternatives.
- (4) Provide recommendations for continued curriculum development and improvement.

C. HISTORY OF THE NAVAL POSTGRADUATE SCHOOL SYSTEMS ACQUISITION MANAGEMENT CURRICULUM DEVELOPMENT

The Systems Acquisition Management Curriculum evolved over a period of approximately two years. A chronology of key events in this development has been provided in Appendix A.

In October 1969, the Chief of Naval Material, in discussing the need for career systems acquisition officer personnel, stated that there should be a career development program for line and staff corps officers which would provide training

in all aspects of the weapons acquisition process and which could ultimately qualify an officer for selection to flag rank outside the normal operational career pattern.⁴ A short time later, Admiral Thomas H. Moorer, then Chief of Naval Operations, directed the Chief of Naval Personnel to "review the syllabus of the Management Course given by the Postgraduate School in Monterey and ensure that it is focused on the specific expertise required by a Navy Project Manager operating in Washington, D. C."⁵ As a result of this directive, a staff study was conducted which led to a series of recommendations concerning the career development and selection of Navy Project Managers. As an adjunct to these recommendations, the Naval Postgraduate School had commenced the development of a curriculum specifically tailored to Systems Acquisition Management. In July of 1970, the first version of the new Systems Acquisition Management Curriculum was forwarded by the Naval Postgraduate School to the Chief of Naval Personnel for implementing approval. The first curriculum is shown in Table I-1.

As a follow-on study to the initial version of the Systems Acquisition Management Curriculum, two Naval Postgraduate

⁴Chief of Naval Material memorandum of 8 October 1969 for the Vice Chief of Naval Operations; Subj: Procurement/Weapons System Acquisition Officer Personnel Career Requirement.

⁵Chief of Naval Operations memorandum OP-00;Dfb Op-00 Memo 335-69 of 2 December 1969 for the Chief of Naval Personnel; Subj: Project Managers; training of

TABLE I-1
SYSTEMS ACQUISITION MANAGEMENT CURRICULUM

JULY 1970

Six-week Academic Refresher

<u>Quarter</u>		
I	MN 3030	Introduction to Economics
	PS 3112	Probability and Statistics
	MN 3106	Behavioral Science
	MN 3060	Management Accounting
II	OA 3202	Methods for Operations Analysis
	MN 4183	Business Data Processing
	MN 3191	Analytical Techniques for Management
	MN 3105	Theory and Practice of Management
III	OA 3202	Survey of Operations Analysis/ Systems Analysis
	OA 3657	Human Factors in System Design
	MN 4181	Management Information Systems
	MN 3941	Engineering Economics
IV	MN 4210	Contract Law
	MN 4141	Systems Analysis
		or
	OA 3204	Systems Analysis
	MN 4152	Financial Policy
	OA 4662	Reliability and Weapons Systems Effectiveness Measurement
V	MN 4171	Procurement & Contract Administration
	MN 4221	Public Sector Finance
	XXXX	Elective (or Thesis)
	XXXX	Elective (or Thesis)
VI	MN 4212	Weapons System Acquisition
	MN 4213	Systems Engineering Management
	MN 4220	R & D Administration
	XXXX	Elective (or Thesis)

School students published a master's thesis entitled Weapons Systems Acquisition Curriculum. The basic approach of this thesis was to develop a project manager model and to test the elements of existing and proposed courses against model attributes in order to establish a course evaluation matrix. From this matrix, a series of project management courses and basic academic discipline courses were sequenced to provide an 18-month curriculum which would produce a graduate who could function effectively in the Navy project management environment.⁶

A significant event in the development and implementation of the Systems Acquisition Management Curriculum occurred in January 1971 when a group of senior naval officers were invited by the Academic Dean to review the objectives of the Management Programs at the Naval Postgraduate School. This conference on Management Program Objectives was called primarily to obtain a high level "client viewpoint" of needed changes to the management programs. It was recognized that the Navy had always placed heavy emphasis on the technical competence of its officers. In more recent years, the solution to the problems of managing the acquisition and operation of sophisticated systems has become more difficult than the solutions to the technical problems. Addressing this subject,

⁶Halladay, M. E. and Murray, J. W., Weapons Systems Acquisition Curriculum, Master's Thesis, Naval Postgraduate School, Monterey, 1970.

Rear Admiral (then Captain) R. G. Freeman, III, USN, Deputy Chief of Naval Material (Procurement and Production), representing the program sponsor, stated that it should be an objective of the management program "to provide a Weapons Systems Acquisition Course responsive to the needs of tomorrow's project managers."⁷

D. OFFICER STUDENT CHARACTERISTICS

Approval by the Chief of Naval Personnel of the Systems Acquisition Management Curriculum was received in January 1971 for implementation the following September. The initial input of 25 students were selected for this program within a set of selection criteria guidelines that called for a highly motivated career naval officer who has:

- (1) Approximately 5 - 12 years service;
- (2) Completed at least one tour at sea;
- (3) Demonstrated leadership qualities; and
- (4) Ability to effectively perform in a high-pressure, rapidly-changing environment.

In order for the officer to be accepted as a student in the Systems Acquisition Management Curriculum, he should possess a baccalaureate degree with above average grades, have completed differential and integral calculus, and preferably have a background in engineering or physical science.

⁷Captain R. G. Freeman, III, USN, Deputy Chief of Naval Material (Procurement and Production) letter to Dean Milton U. Clauser, Naval Postgraduate School of 27 January 1971.

The students entering the Systems Acquisition Management Curriculum in September 1971 and March 1972 are currently enrolled in a revised curriculum as shown in Table I-2.

In the chapters that follow, the methodology used in the design and development of the revised curriculum is discussed. This new curriculum is then evaluated and several new alternative curricula considered. Based on the analysis of alternative curricula, a recommendation is made which, in the considered opinion of the authors, will assure that the educational requirements for naval officers educated in acquisition management will be met.

TABLE I-2
REVISED SYSTEMS ACQUISITION MANAGEMENT CURRICULUM
SEPTEMBER 1971

<u>Quarter</u>	Six-week Academic Refresher	
I	SM 3301	Introduction to Systems Acquisition
	MN 3150	Financial Accounting
	SM 3302	Fundamentals of Project Management
	OS 3201	Fundamentals of Operations Analysis
	SM 0001	Seminar for Systems Acquisition Management Students
II	MN 3140	Economics for Project Management
	MN 3161	Managerial Accounting
	SM 3304	The Behavioral Sciences and Project Management
	OS 3202	Methods for Operations Analysis/ Systems Analysis
	SM 0001	Seminar for Systems Acquisition Management Students
III	MN 4145	Systems Analysis
	OS 3203	Survey of Operations Analysis/ Systems Analysis
	SM 3305	Project Information Systems
	OA 4662	Systems Effectiveness Measurement
	SM 0001	Seminar for Systems Acquisition Management Students
IV	SM 4303	Procurement Planning and Negotiation
	SM 4302	Public Expenditure, Policy and Analysis
	SM 4301	Systems Engineering Management
	SM 0810	Thesis
	SM 0001	Seminar for Systems Acquisition Management Students
V	SM 4304	Contract Administration
	MN 4101	Personnel Management and Labor Relations
	SM 4305	Logistics
	SM 0810	Thesis
	SM 0001	Seminar for Systems Acquisition Management Students
VI	MN 4172	Defense Marketing
	XXXX	Elective
	XXXX	Elective
	SM 0810	Thesis
	SM 0001	Seminar for Systems Acquisition Management Students

II. METHODOLOGY OF CURRICULUM DESIGN AND DEVELOPMENT

A. METHODOLOGY

The Chief of Naval Personnel approved the 18-month Systems Acquisition Management Program in January 1971. At that time a faculty curriculum committee was established to review the July 1970 Systems Acquisition Management (SAM) course offerings to determine if they adequately met the educational requirements of future Navy Project Managers.

Ten officer-students who were motivated toward a career in systems acquisition were selected to assist the faculty committee and serve as a pilot group in the development and teaching of SAM courses. This student pilot group and the six-member faculty committee worked together for a period of approximately six months in the revision of the curriculum and the development of SAM courses to be offered in the fall quarter of 1971.

The first priority of effort by the faculty/student committee in the revision of the curriculum was to define problem areas and establish objectives, then through an iterative decision-making process, to optimize the curriculum given a variety of constraints. The decision model utilized is shown in Fig. 2-1.⁸ The initial meeting of the faculty/student committee in early

⁸English, J. M. (ed.), Cost Effectiveness: The Economic Evaluation of Engineered Systems, p. 29, J. Wiley and Sons, Inc. 1968.

DECISION MODEL

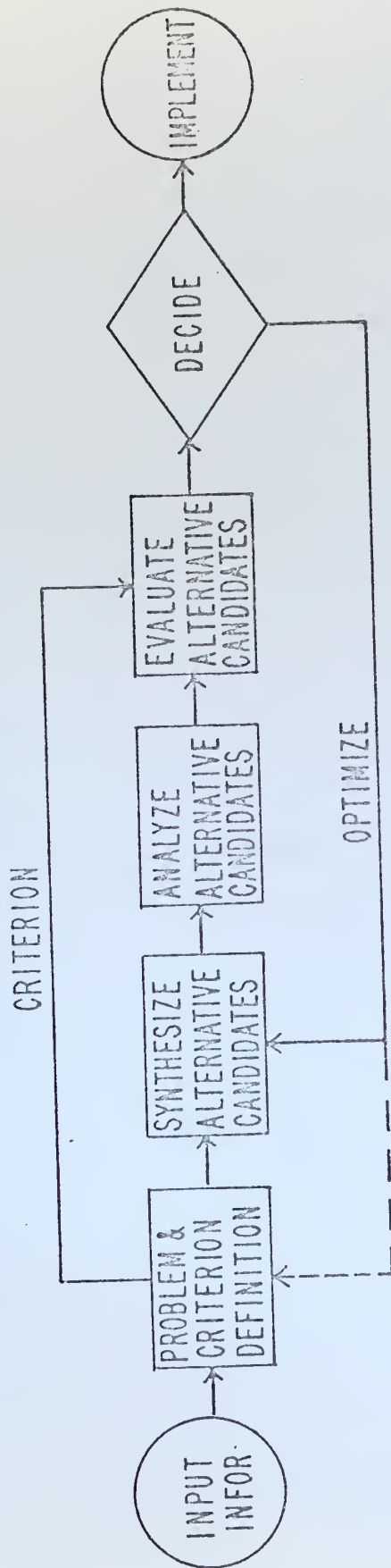


Figure 2-1

April 1971 produced the broad problem definition to revise the existing SAM curriculum to:

- (1) Better reflect the users' needs;
- (2) Achieve proper balance between
 - (a) Navy project manager requirements,
 - (b) Degree requirements,
 - (c) Naval officer professional development requirements.

The objective was to provide a reservoir of capable, educated, career-oriented managers to meet the Navy's needs for staffing acquisition projects at the headquarters and field activity levels. It was determined that the curriculum should emphasize the system life cycle, oriented toward real world problem solving in a simulated project environment. Utilizing the knowledge, concepts, tools and techniques learned in the curriculum, the officer should be equipped to function effectively in the systems acquisition environment.

In developing a decision model to simulate the problem resolution, several basic inputs were identified as requiring special investigation. These inputs were stratified into the following areas:

- (1) Navy needs
- (2) Constraints
- (3) Assumptions
- (4) Information gathering
 - (a) Applicable subjects and topics
 - (b) Existing curricula

[1] Internal course review

[2] External course review

(c) Case studies and problem exercises.

Based on these information requirements, the faculty/student committee formed several sub-committees to gather the required data, analyze these inputs and make recommendations for the use of this information.

B. NAVY NEEDS

In order to provide a valid input into the curriculum for meeting the needs of the Navy, it was determined that a questionnaire should be developed to solicit the ideas and draw on the experience of current and former Navy Project Managers and other senior naval officers associated with major defense system acquisitions. The faculty/student committee designed the questionnaire around 14 selected subject areas intended to identify the most important topics to be included in the courses to be offered in the SAM Curriculum. The questionnaire is displayed in Appendix B.

The questionnaire was sent to approximately 145 individuals concerned with Navy project management. Two copies of the questionnaire accompanied each letter so that the recipients could give them to additional people they considered most qualified to answer the questionnaire. The questionnaires were coded to reflect the identity of various specialty groups, i.e., unrestricted line, restricted line and staff corps officers as well as those currently designated as major Project Managers.

In completing the questionnaire, the recipients were requested to rank each subject area and topic within the subject area on a 0 to 10 scale. Using these assigned ratings, the information was processed through a computer program which computed the mean, standard deviation, quartiles, and a histogram for each subject/topic. A total of 113 questionnaires were returned prior to the cut-off date established for machine processing. The information thus obtained was considered to reflect the current educational requirements the Navy Project Manager needs to successfully prosecute his program. Appendix C shows the result. All data received was analyzed for subject/topic emphasis. General and specific comments recorded in the remarks section of the questionnaire were abstracted for consideration in course development.

C. CONSTRAINTS

The following constraints and requirements were initially established to provide a framework in which to design the curriculum:

- First class input on 27 September 1971
- 18-month (six-quarter) curriculum
- Naval Postgraduate School academic requirements
- Naval Postgraduate School entrance requirements
- Officer student characteristics
- Existing courses
- Existing faculty
- New courses

- Case studies and problem exercises
- Thesis requirements.

D. ASSUMPTIONS

The following assumptions were made in relation to the implementation of the Systems Acquisition Management Curriculum in September 1971:

1. Students selected for the SAM Curriculum would possess the academic prerequisites and professional background set forth in Chapter I.
2. The faculty scheduled to be on board during the initial student input to the SAM Curriculum would possess the necessary background and expertise to provide relevant classroom instruction oriented toward the Navy project management environment.
3. The duration of the curriculum would be six academic quarters.
4. A six-week academic refresher period would be offered.
5. Some electives would be offered in lieu of a fully prescribed set of courses.
6. Current and "real world" events in Navy project management would be emphasized through seminars and by guest lecturers.
7. A thesis would be required.

E. INFORMATION GATHERING

The information gathering process featured a number of elements which were considered essential in curriculum design. These elements included data obtained from the questionnaire and (a) a subject structure matrix; (b) review and analysis of existing courses offered at the Naval Postgraduate School; (c) review and analysis of courses and curricula offered external to the Naval Postgraduate School; (d) review of sources for case studies and problem exercises applicable to the SAM Curriculum.

1. Subject Structure Matrix

During the initial formulation of the student pilot group, a requirement was generated to develop a listing of key words that could apply to the 14 subject areas considered to be essential to the SAM curriculum. It was determined that this listing should be structured under these 14 areas by topic, sub-topic, element and sub-element. The resultant listing would be matched against the completed questionnaire, internal and external course review data and a SAM case study/problem exercise file to ensure all relevant course topic key words were included in the listing. As the individual courses were definitized, each subject area, topic, sub-topic, element and sub-element would be evaluated for the required emphasis. Through an iterative process of review and updating by both the student pilot group and the faculty committee, a subject structure matrix was developed that included approximately

500 key words listed in a structured format by major subject area. Further updating and restructuring continued during the course development process in order to provide the most current listing of topics consistent with the objectives of the SAM Curriculum.

2. Internal Course Review

The second element in the SAM Curriculum design and development was the review and analysis of courses currently being offered in the master's degree program at the Naval Postgraduate School (NPS). The originally approved curriculum set forth in Table I-1 was developed primarily around currently available courses. The student pilot group made an extensive analysis of these courses vis-a-vis the questionnaire results and the subject structure matrix and recommended a sequence of existing and proposed courses that would provide a more meaningful curriculum for the class entering in September of 1971. This curriculum and the rationale behind its development were used in the finalization of the current curriculum.

3. External Course Review

Courses of instruction external to the Naval Postgraduate School were identified, reviewed and analyzed for SAM Curriculum design inputs. This process encompassed research of programs offered by several civilian institutions as well as Department of Defense educational and training programs relating to systems acquisition. Included were:

a. Systems Management: University of Southern California.

b. Systems Procurement and Project Management: George Washington University.

c. Project Management - Defense and Aerospace Marketing: Harvard University.

d. Goddard Research and Engineering Management Exercise: Northwestern University.

e. Systems Management Curriculum: Air Force Institute of Technology.

f. Defense Systems Management Course: Defense Systems Management School.

g. Baseline Course: Navy Logistics Management School.

h. Management in the Department of Defense: Industrial College of the Armed Forces.

i. Cost Estimating Techniques for Systems Acquisition: U. S. Army Logistics Management Center.

j. Test and Evaluation Management Seminar: U. S. Army Logistics Management Center.

4. Case Studies and Problem Exercises

A case study and problem exercise sub-committee was formed with the purpose of locating sources for case studies and problem exercises, acquiring those documents applicable to the SAM Curriculum, obtaining abstracts and then indexing these cases and exercises in a computer file to facilitate

access and retrieval. Ten major sources provided a potential list of several hundred cases and exercises associated with the systems acquisition discipline. These sources are identified below.

a. Naval Postgraduate School (NPS). A file search of the Naval Postgraduate School Library was conducted which provided a listing of reports and writings applicable to Project Management. Twenty-six documents were found to be of significance to the SAM Curriculum. Additionally, a compilation of case study abstracts relating to the broad area of management was prepared by a Naval Postgraduate School student in December 1969. A review of these abstracts produced another 49 cases.

b. Defense Documentation Center (DDC). A bibliography was extracted under the subject area of Weapons Systems Acquisition. This bibliography and associated publications were not case studies or problem exercises in the traditional sense, but were found to be beneficial as research materials and instructional aids.

c. Defense Logistics Studies Information Exchange (DLSIE). A bibliography for Weapons System Acquisition was forwarded by DLSIE which contained the abstracts of 173 reports, theses, and other publications relating to project management.

d. Commission on Government Procurement. The Commission published a bibliography of reports, articles,

cases and other writings applicable to the general area of government procurement. From this bibliography, 11 cases were obtained for file input.

e. International Case Clearing House, Harvard Business School. The 1971 and prior issues of the Inter-collegiate Bibliography of Cases in Business Administration contained an inventory of approximately 5,000 cases, of which several hundred have potential application to the systems acquisition management discipline.

f. Defense Systems Management School (DSMS). A simulation exercise of the entire life cycle in the acquisition of a major defense system (System X) has been obtained from DSMS for use in the SAM Curriculum. A shorter and less complex management game, Defense Management Simulation (DMS), is currently under evaluation for use by the Naval Postgraduate School. This simulation exercise is presently used at both DSMS and the Industrial College of the Armed Forces (ICAF).

g. Northwestern University. This university has developed a simulation exercise, Goddard Research and Engineering Management Exercise (GREMEX) which requires the student to integrate his knowledge and focus it on complex problems under realistic conditions. It is similar in many respects to System X.

h. General Accounting Office. Reports to Congress by the Comptroller General of the United States concerning the acquisition of major defense systems are available and could

form the basis for developing case studies and provide a valuable learning device to bring real world events into the classroom.

i. Naval Material Command. The Naval Material Command and its subordinate systems commands have indicated a willingness to provide source material for the development of case studies relating to the management of major defense systems. Some of these materials have already been provided for development of case studies by the faculty.

j. Congressional Hearings. Several volumes of Congressional Hearings provide excellent sources for the development of case studies in defense systems acquisition. The applicable hearings are referenced in the bibliography.

F. FACULTY/STUDENT INTERFACE

The integration of inputs into a revised SAM Curriculum became the task of the faculty/student curriculum committee. Assignments were made for the review and proposal of course content in the major subject areas as follows:

- Financial Management
- Economics
- Operations Research/Quantitative Methods
- Information Systems
- General Management
- Systems Acquisition Management.

Typically, one or two faculty members were assigned the responsibility for proposing suitable courses in their area of

specialization aided by members of the student pilot group. Milestones were established and meetings scheduled to discuss progress, coordinate, and make trade-offs to achieve the best mix of courses and thesis projects consistent with the time constraints imposed in an 18-month curriculum.

Utilizing the information received from the questionnaire and the other data obtained during the information gathering process, problems and criteria were defined followed by a synthesis of alternative proposals in each subject area. From these proposals, sample course offerings were developed. Then, using the iterative decision-making process shown in Figure 2-1 to optimize the various options, the revised SAM Curriculum to be offered in September 1971 was developed.

The final task was that of developing individual course outlines, indicating the approximate number of hours devoted to each major course topic, a course description and a definition of course objectives. These were completed in August 1971. Sample course outlines and the approved course descriptions are shown in Appendix D and Appendix E, respectively.

III. AN APPROVED CURRICULUM

A. COMPARATIVE ANALYSIS

The first version of the Systems Acquisition Management curriculum was approved by the Academic Council of the Naval Postgraduate School in July 1970. It was composed primarily of existing courses offered in the Management and Operations Research curricula with a group of new acquisition-related courses added in the fifth and sixth quarters. This curriculum is shown in Table I-1.

Methodology used in developing the revised curriculum was discussed in Chapter II. The July 1970 version preceded the questionnaire, subject structure matrix, and establishment of the SAM Curriculum committee and student pilot group, all of which were used in arriving at the revised curriculum shown in Table I-2.

Comparison of the two versions, shown in Table III-1 indicates that six courses from the July 1970 curriculum do not appear in September 1971, and five courses have been added. This resulted from merging the questionnaire results, subject structure matrix, and SAM Curriculum committee and student pilot group inputs into new SAM courses. The new courses were developed to include partial coverage for the courses that appear to have been dropped.

Some of the existing courses were changed, i.e., Theory and Practice of Management (MN 3105) became Fundamentals of

TABLE III-1

COMPARISON OF THE JULY 1970 VS. SEPTEMBER 1971 VERSIONS
OF THE SAM CURRICULUM

<u>QUARTER</u>	<u>JULY 1970</u>	<u>SEPTEMBER 1971</u>
I	PL 3112	OS 3201
	MN 3030	MN 3150
	MN 3060	SM 3301
	MN 3106	SM 3302
II	MN 3105	MN 3140
	MN 3191	MN 3161
	MN 4183	SM 3304
	OA 3202	OS 3302
III	MN 3941	OS 3203
	OA 3203	SM 3305
	MN 4181	MN 4145
	OA 3657	OA 4662
IV	MN 4145	SM 4303
	OA 4662	SM 4302
	MN 4210	MN 0810
	MN 4152	SM 4301
V	MN 4171	SM 4304
	MN 4221	MN 4101
	XXXX	SM 4305
	XXXX	MN 0810
VI	MN 4213	MN 4172
	MN 4212	XXXX
	MN 4220	XXXX
	XXXX	MN 0810

- Note:
- (1) XXXX designates elective courses.
 - (2) SM 0001, a no-credit SAM seminar course was added to each quarter of the September 1971 curriculum, but is not shown above.
 - (3) Both versions offered a six-week academic refresher.

Project Management (SM 3302), Management Information Systems (MN 4181) became Project Information Systems (SM 3305), etc. These are representative of those courses that were modified to provide greater emphasis on project management, as opposed to management in the traditional sense.

Material from two economics courses found in the July 1970 curriculum (MN 3030 and MN 3941) was combined into one course (MN 3140) in the September 1971 version, whereas Procurement and Contract Administration (MN 4171) was expanded into two courses, Procurement Planning and Negotiation (SM 4303) and Contract Administration (SM 4304). Similar trade-off decisions were made in order to arrive at the best array of courses within the six-quarter time constraint, allow for adequate thesis preparation time, and still provide the flexibility of some student-selected electives.

B. EVALUATION

At the time of this writing, the first class of SAM students had completed only two academic terms. Although it is premature to attempt a complete assessment of the curriculum as an entity, it is possible to compare the courses offered in the September 1971 curriculum with user requirements, analyze the original assumptions made in Chapter II, and project strengths and weaknesses based upon experience to date.

1. User Requirements

Fourteen subject areas were identified in the

questionnaire distributed in April 1971. These represented course study areas that were being considered at that time for one or more courses in the SAM curriculum.

The senior naval officer questionnaire recipients, all of whom had present or past experience in project management, were asked to rate the relative importance of each subject area. A ranking of these areas, based upon means of the rating responses, is shown in Figure 3-1.

Both subject areas and individual topics were used in formulating the courses contained in the revised curriculum. One or more SAM courses evolved from all of the 14 areas, with the exception of Projection Management and Political Science. Production Management topics were integrated into Systems Engineering Management (SM 4301) and Contract Administration (SM 4304).

Some Political Science topics were distributed among other courses, including Defense Marketing (MN 4172) and Public Expenditure, Policy and Analysis (SM 4302). Other topics emerged as individual SAM courses, i.e., Project Information Systems (SM 3305) and Systems Effectiveness Measurement (OA 4662).

Table III-2 shows the relationship between the subject areas and courses in the revised curriculum.

2. Analysis of Assumptions

In continuing the evaluation, it is necessary to consider the validity of the assumptions used in establishing the parameters for developing the revised curriculum.

SYSTEMS ACQUISITION MANAGEMENT QUESTIONNAIRE - APRIL 1971

SUBJECT AREA RANKING OF RELATIVE IMPORTANCE

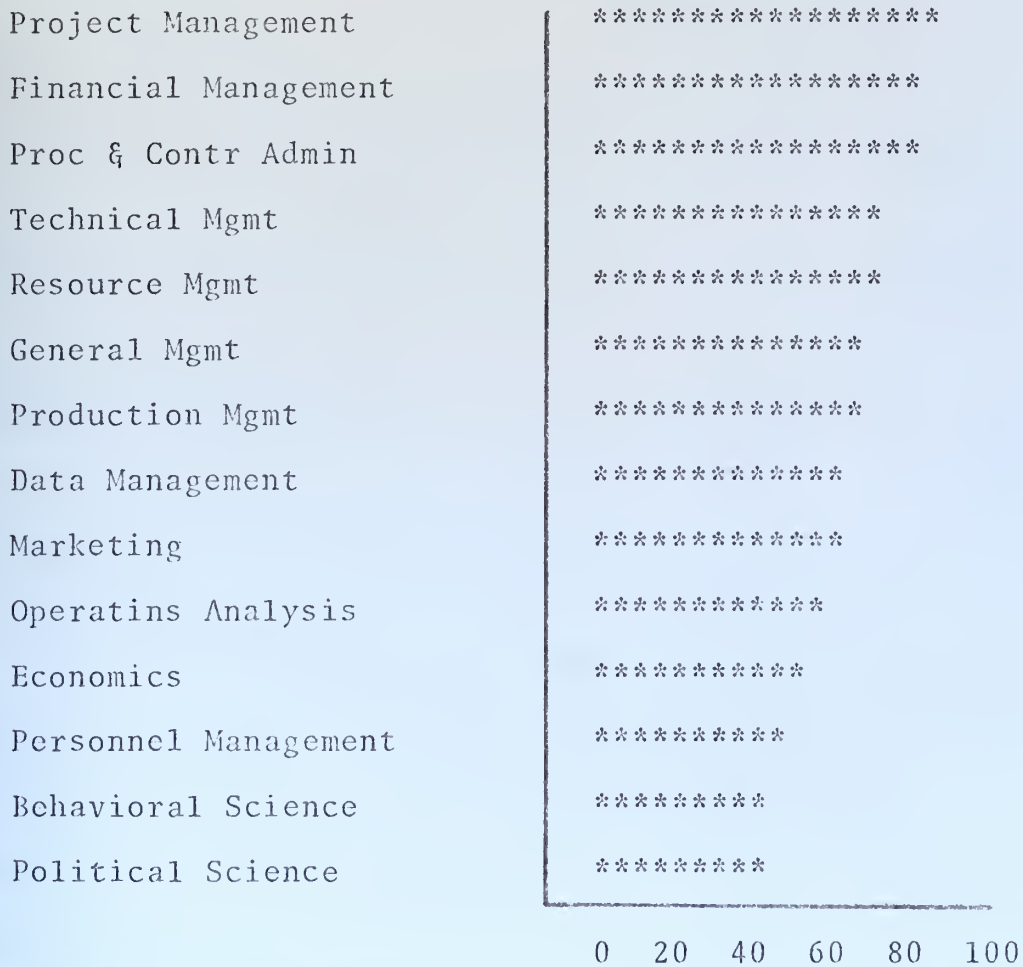


FIGURE 3-1

TABLE III-2
SUBJECT AREA VS. COURSE COMPARISON

<u>SUBJECT AREA</u>	<u>COURSES IN THE 9/71 CURRICULUM</u>
General Management	SM 3302 - 1st Quarter
Acquisition (Project) Management	SM 3301 - 1st Quarter MN 0810 - Last 3 Quarters SM 0001 - All Quarters
Technical Management	OA 4662 - 3rd Quarter SM 4301 - 4th Quarter
Production Management	(See discussion)
Resources Management	MN 4145 - 3rd Quarter SM 4302 - 4th Quarter MN 4305 - 5th Quarter
Procurement & Contract Admin.	SM 4303 - 4th Quarter SM 4304 - 5th Quarter
Financial Management	MN 3150 - 1st Quarter MN 3161 - 2nd Quarter
Data Management	SM 3305 - 3rd Quarter
Political Science	(See discussion)
Marketing	MN 4172 - 5th Quarter
Economics	MN 3140 - 2nd Quarter
Operations Analysis/Quantitative Methods	OS 3201 - 1st Quarter OS 3202 - 2nd Quarter OS 3203 - 3rd Quarter
Behavioral Science	SM 3304 - 2nd Quarter
Personnel Management	MN 4101 - 5th Quarter

a. Six-Quarter Duration

The length of the curriculum was originally established at six quarters in order to provide an education that meets the academic requirements for an MS degree in Management and the needs of the user community. Since no room is provided for offering additional courses, six quarters is considered to be the minimum time required to meet the stated objectives of the curriculum. Alternatives for changing the present curriculum in content by extension to seven and eight quarters, will be discussed in Chapter IV.

b. Six-Week Refresher Period

Most students have been away from mathematical problem solving for a period of years and many also lack knowledge in the field of electronic data processing. These disciplines are used in most courses throughout the curriculum and, therefore, students should have achieved a basic proficiency level preferably before starting classes in the first quarter.

The current six-week refresher period preceding the first term of classes, aids in the attainment of this proficiency, through a refresher course in calculus and a TV-aided introductory course in computer programming.

Since NPS has not recognized the refresher period as a required part of the curriculum, all students have not attended. This has resulted in an unbalanced proficiency level within the classes, to the detriment of both students

and faculty. In order to correct this problem in the SAM Curriculum, all students should be required to attend the refresher or this material will have to be presented during the first quarter.

c. Electives

The SAM Curriculum committee expressed a strong preference for providing electives in the revised curriculum to assure that students had some degree of choice in selecting courses that would meet their individual needs and interests.

To accommodate this requirement, it was necessary to trade off coverage in other areas, i.e., production management, political science, behavioral science and computer methods, to keep within the six-quarter time constraint. This means that the benefits that accrue from having the electives in the curriculum create deficiencies in other areas such as those given above.

d. Real World Emphasis

The present curriculum relies upon faculty, case studies, seminar guest speakers, and takes advantage of the past experience of students to provide real-world emphasis. This need has been re-emphasized by project managers and senior Navy and Department of Defense officials as being essential in teaching the students how to apply the knowledge learned in their educational program to operating and finding solutions to problems in the current project environment.

Present means for providing this emphasis are severely limited in scope since students do not have the

opportunity to observe project office operations and personally participate in actual problem solving as a part of their educational experience.

e. Thesis

Since a thesis will require the SAM student to demonstrate knowledge previously acquired in the curriculum, it is considered an important part of the total academic program.

3. Strengths and Weaknesses

Assessment by faculty, SAM students, and experienced project management officials revealed that the current curriculum has definable strengths and weaknesses which are identified in Table III-3. This illustration provides the point of departure for developing the alternatives for future change in Chapter IV.

TABLE III-3
STRENGTHS AND WEAKNESSES OF THE SEPTEMBER 1971
SAM CURRICULUM

<u>STRENGTHS</u>	<u>WEAKNESSES</u>
1. Meets academic requirements for MS degree in Management.	1. Lacks depth of coverage in political science, production management, behavioral science, and computer methods areas.
2. It is the only postgraduate curriculum dedicated to Navy acquisition management available at any educational institution.	2. Minimum room for expansion of present courses or addition of new ones.
3. Provides broad coverage in areas of need expressed by Navy project managers.	3. Although a refresher period is provided, attendance is not mandatory and all students do not attend.
4. Provides depth in most subject areas.	4. Insufficient emphasis on the real-world environment.
5. Provides for student-selected electives.	
6. Provides for student thesis.	

IV. FUTURE CURRICULUM ALTERNATIVES

A. SAM CURRICULUM DEFINITION MODEL

In order to develop and compare alternatives that address the weaknesses identified in Chapter III, it is necessary to establish a point of reference for discussion. Figure 4-1, the SAM Curriculum Definition Model serves this purpose by identifying the three input dimensions that must be considered in defining an optimum curriculum. These are content, time and cost. The model also defines the output dimension as maximum utility, to the Navy and individual officers.

This chapter will discuss methods of instruction that affect curriculum content, and then continue by presenting alternative models which consider the dimensions of content and time. The cost dimension will be introduced during an evaluation of the curriculum alternatives.

B. METHODS OF INSTRUCTION

The SAM program cannot be improved simply by adding courses to the present curriculum. Methods of instruction that will increase the ability to provide a better balance of academic requirements and real-world emphasis must be provided. Several new approaches will be discussed, but it is necessary to recognize that no single method will provide an optimum solution. It is only through combination of this methodology in the proper proportions that the desired balance will be achieved.

SAM CURRICULUM DEFINITION MODEL

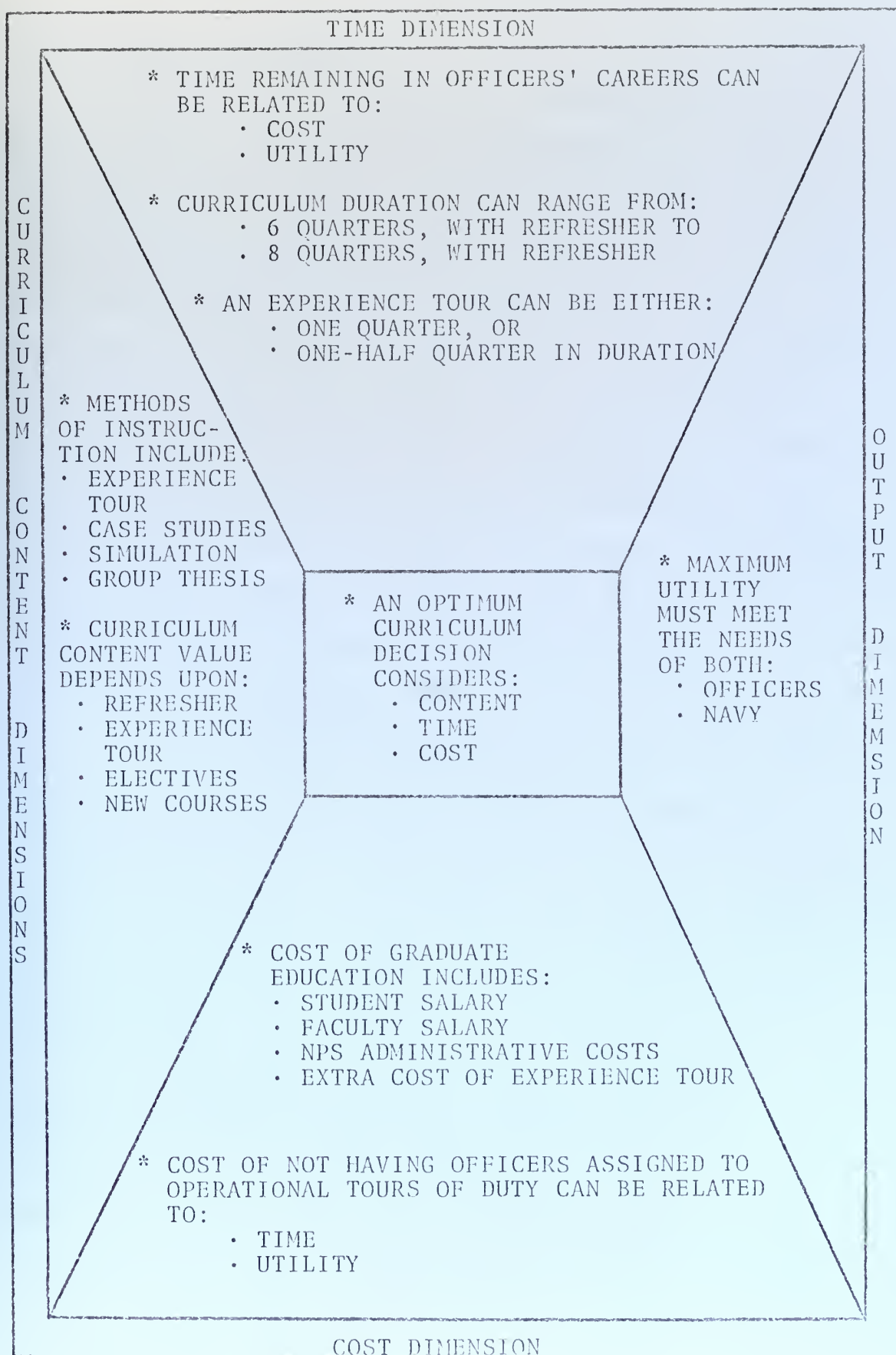


FIGURE 4-1

1. Experience Tours

Assignment of officers to a project, group of project offices and supporting headquarters, or field functional offices during the course of the SAM program is defined as an experience tour. Its purpose is to provide students with exposure to actual project office operations, as well as to establish how the project office interrelates with other project, functional, and field organizations. The student will become involved in the solution of actual problems in project management, and thereby gain valuable experience and insight, which can be used to relate actual situations to the previous and remaining courses at Naval Postgraduate School.

a. Tour Duration

At present the NPS two-year Operations Analysis curriculum provides for the assignment of students to six-week experience tours during the last half of the fifth quarter. During the first part of the quarter, students take two four-hour courses at NPS. A similar concept could be established for SAM students.

The opportunity to discuss the experience tour concept with project and project related officials was provided to one of the authors during a recent field trip to Washington, D. C. The primary objective was to gather information and educational materials for use in further

developing the SAM curriculum.⁹ Universal support for the experience tour concept was expressed, but there was a general feeling that limiting it to six weeks would present some difficulties. Since there are instances when both project managers and leading staff members are fully occupied with extended negotiations, budget hearings or travel, there would be times when they would not have sufficient time to spend with the students. Conversely, a whole quarter would enable students to develop an overall understanding of project operations, participate in specific problem areas in sufficient depth to be worthwhile, and observe events such as negotiations, budget hearings, program reviews and special presentations.

b. Alternatives Available for Officer Assignment

Discussions with project managers also indicated that there are several ways in which students could be assigned to experience tours:

- Assignment of individual officer to one organization.
- Assignment of individual officer to more than one project.
- Assignment of more than one officer to a single project.
- Assignment of officers on a team basis to a group of interrelated offices, e.g., project office, supporting SUPSHIP or NAVPRO, or supporting field activity (NAVSEC, NAEC, NSMSES, etc.).

⁹The field visit Term Project Summary is contained in Appendix G.

Since project organizations vary considerably in management orientation and staffing, and are in different stages of the project life-cycle, they can be expected to have different preferences for the numbers of students assigned at any one time. Having these alternatives available will facilitate meeting the needs of students and desires of the project managers.

c. The Experience Tour as an Information Source

Experience tours are a means of gathering information from a wide variety of project organizations, which can be applied by students to both course work and thesis preparation. Appendix G provides four examples of the types of information that can be gathered and serve as a basis for development into case studies or problem-solving exercises.

Appendix G, Cases 1 and 2 represent the the kinds of organizational studies that can be further developed into individual cases or incorporated into project simulation exercises. Case 1 concerns the staffing of a Naval Ordnance Systems Command project office, whereas Case 2 emphasizes the project workload of a Ships System Command project. Both cases can be used in project management, personnel management, or behavioral science courses.

Cases 3 and 4 apply to a Supervisor of Ship-building organization. Case 3 provides an insight into the organizational structure and possible changes that could

develop as a result of implementing the business manager concept. Case 4 presents real life problems in field contract administration and suggests a method of presentation for student exercises in contract administration courses.

d. Benefits

The primary benefit of an experience tour will be that of exposing students to the real-world project environment. Secondarily, it may provide a means for applying the methodology and techniques learned in the courses previously taken. The new knowledge gained can be utilized in the remaining courses, thesis preparation and in future assignments.

Although most SAM students will not have had prior experience in project offices, they are experienced in specific operational systems and sub-systems, i.e., surface ships, submarines, aircraft, weapons systems, etc. With this fact in mind, the experience tour can be designed either to supplement past experience or to provide a new experience that may not otherwise be available in normal tour rotation. Examples of both approaches are shown below:

- Surface Line Officer
 - assign to a ship or weapon system acquisition project office or SUPSHIP.
 - assign to a submarine project.
- Submarine Officer
 - assign to a submarine or weapon system project.

- assign to a surface ship acquisition project office.
- Aviation Officer
 - assign to an aircraft acquisition project or NAVPRO.
 - assign to an aircraft related ship acquisition project or SUPSHIP.

Both approaches have advantages and disadvantages. The primary point to be stressed is that the experience tour can provide students with a type of experience tailored to meet their individual needs and preferences, beyond that provided in a regular tour of duty.

2. Simulation

Simulation, when applied to the SAM Curriculum, can be effectively utilized by assigning students actual project office roles and having them solve problems concerning the management of the acquisition of a simulated defense system, from the initial planning phases through the duration of the acquisition process.

The primary objectives of the SAM Curriculum include emphasis on the system life-cycle, introducing the real-world project environment, and integration of the disciplines used in project problem-solving and decision-making. Simulation serves to bring together these requirements by having the students solve real problems through application of knowledge gained in previous courses.

a. Current Status of Simulation

(1) Simulation has been introduced in the Procurement and Contract Administration courses on an experimental basis, as part of the SAM Curriculum. The students assume project office rules, as well as those of contracting systems command, NAVMAT, OPNAV, SECNAV, and OSD officials who participate in the decision-making process of a major defense system acquisition. System requirements and specifications are developed by the students themselves. They develop and document all of the primary steps from project initiation through requesting a proposal from a contractor. The climax of this series of exercises is the actual negotiation of a contract. Assistance from contractors and Navy Field procurement offices can provide realism to the negotiation process.

(2) The Industrial College of the Armed Forces (ICAF) and the Defense Systems Management School (DSMS) have both developed computer assisted simulation exercises, paralleling the life-cycle of a major system acquisition. These are designed to teach students how to react to and solve actual problems in project management. Both computer programs and related exercises are being adapted for use by the Naval Postgraduate School.

b. Other Uses for Simulation

(1) Case studies or problem-solving exercises can be used in individual SAM courses by assigning roles to students for the purpose of developing classroom solutions.

(2) Examples of simulation exercises are shown in Table IV-1. They can be developed for single course use or as part of a series of interrelated cases or exercises for presentation over a period of time, in a progression of courses. Roles can be alternated for each course so that one student would not be the project manager for all exercises in the series.

(3) A specific block of time can be established for running a complete simulation exercise on a full-time basis. If the total number of students in a given class exceeds the number of participating roles, several project teams could be established for purposes of working the exercise.

3. Group Thesis

The group thesis concept provides the opportunity for students to apply the sum of the knowledge, concepts, methodology, tools and techniques learned to the solution of a life-cycle, system-oriented problem. It can range from one of total structuring, such as those used by ICAF and DSMS, to a completely unstructured problem relevant to the present day Navy environment. The group itself can range in size from an entire class to teams of students.

This concept, when applied to the SAM Curriculum, would be an integrated total system simulation exercise in which the problem-solving effort would be documented in the group thesis. Ideally, over a period of time, the concept

TABLE IV-1

SAMPLE SIMULATION EXERCISES

<u>COURSE</u>	
Fundamentals of Project Management	Organize and establish a project office.
Financial Accounting	Evaluate a company financial accounting and reporting system in terms of being able to accommodate a prospective system acquisition.
Managerial Accounting	Evaluate a company's ability to finance the equipment and facilities required to build a major defense system.
Project Information Systems	Design and implement an information system for use by a project office.
Systems Analysis	Perform a cost-effectiveness analysis.
Systems Effectiveness Measurement	Evaluate a proposed reliability and maintainability proposal.
Procurement Planning & Negotiation	Develop an APP, RFP and conduct negotiations.
Systems Engineering Management	Develop a systems ILS plan.
Contract Administration	Propose solutions to resolve contract modification, claim and change order problems.
Public Expenditure, Policy & Analysis	Develop, present and defend a project financial plan.
Procurement, Contract Administration or Systems Engineering Management	Perform cost vs. performance vs. schedule trade-off analysis

can evolve into one whereby the solution of real present-day problems could be aided through the group thesis process.

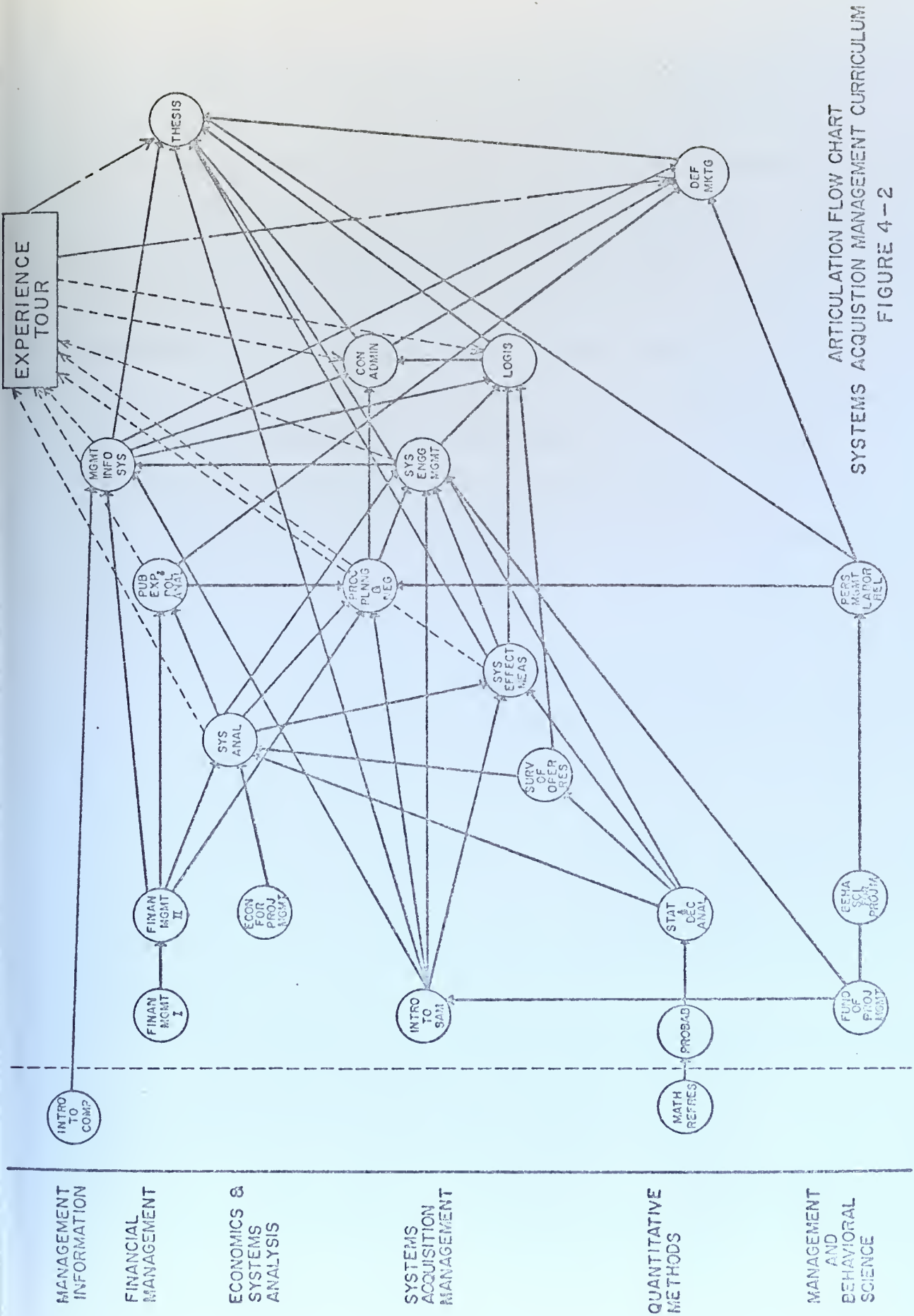
4. Curriculum Articulation

There is a multi-faceted relationship between individual courses, the experience tour, and the group thesis. To demonstrate how the courses interrelate, an articulation flow chart was designed by the SAM Curriculum committee. The original chart was updated to include the experience tour (See Figure 4-2) and now shows:

- How the subject areas relate to the SAM courses.
- The course interrelationships.
- The relative position of the experience tour in the sequence of courses and its relationship to the courses.
- How the experience tour and remaining courses articulate toward the group thesis.
- How the group thesis is the culminating experience in the SAM Curriculum.

C. CURRICULUM ALTERNATIVE MODELS

Alternatives for future change include restructuring courses within the present six-quarter time frame and expansion of course offerings through extension of the curriculum to seven or eight quarters. Six, seven, and eight-quarter curriculum alternative models have been developed to display the trade-off process between duration and content in building a curriculum for the future.



ARTICULATION FLOW CHART
SYSTEMS ACQUISITION MANAGEMENT CURRICULUM
FIGURE 4-2

A common curriculum baseline, consisting of all courses in the September 1971 SAM Curriculum (see Table I-2) less the refresher period and two elective courses, has been established for the three curriculum models. Since the six-week refresher period is considered to be part of the present SAM Curriculum, it is used as a variable in modeling. It is equivalent to a half-quarter in time, during which two four-hour courses can be offered. When a refresher period is not provided, it is considered necessary to include these courses in the first quarter.

Alternatives are developed in Figures 4-3, 4-4 and 4-5 by manipulation of course variables, which include:

- a six-week refresher
- a one-quarter experience tour (11 weeks)
- a half-quarter experience tour (six weeks)
- elective courses
- new courses in
 - production management • behavioral science
 - computer methods • political science

Lack of depth in these areas was considered a weakness of the present curriculum in Table III-3.

1. Six-Quarter Curriculum Alternative Model (Figure 4-3)

The September 1971 curriculum, which includes the curriculum baseline, six-week refresher and two elective courses is identified as Alternative 6. This alternative was previously discussed in Chapter III, and its strengths

SIX-QUARTER CURRICULUM
ALTERNATIVE MODEL

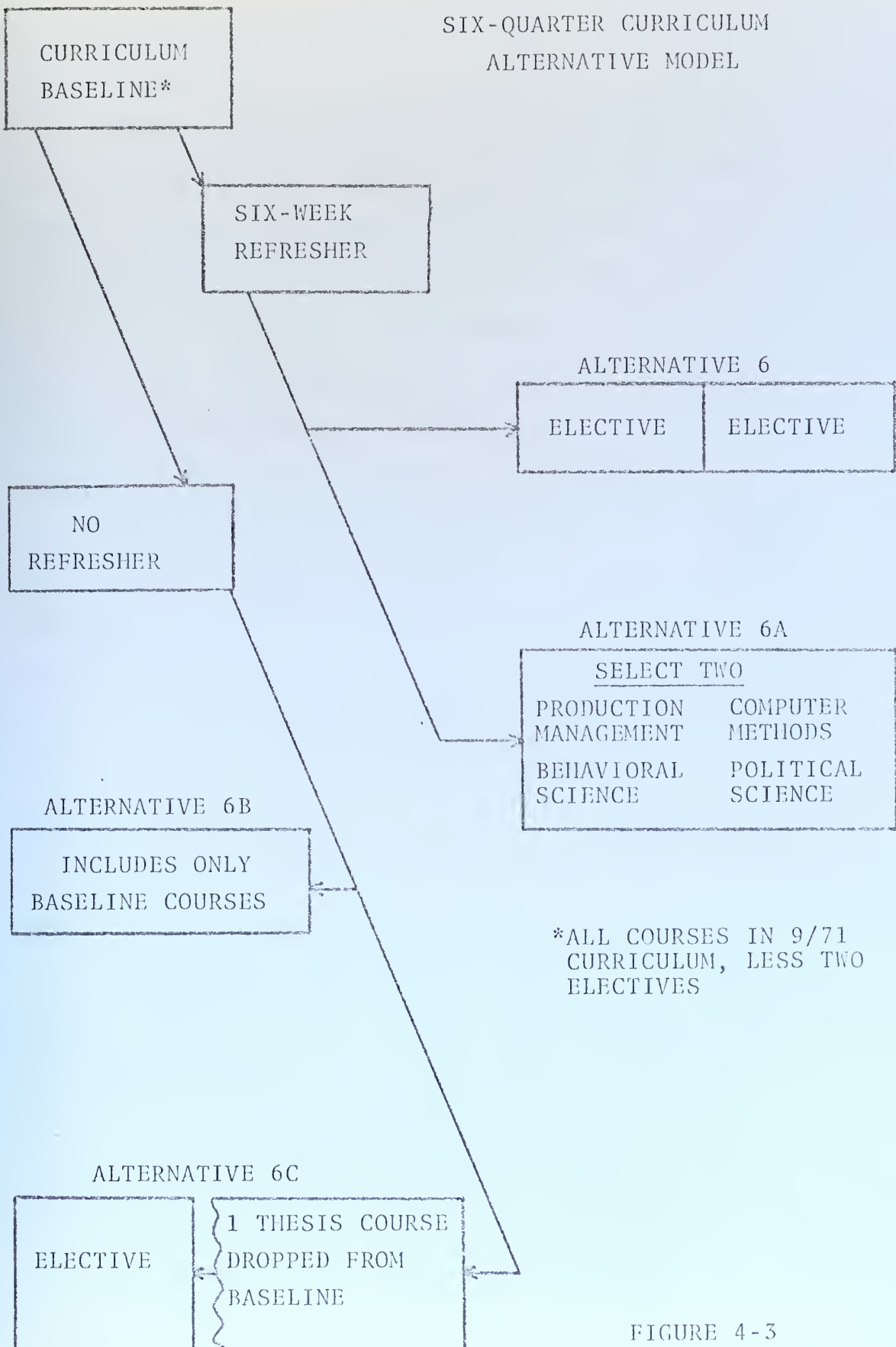


FIGURE 4-3

and weaknesses will be used as a basis for developing other alternatives.

Within the six-quarter time frame, the only way to add coverage, in areas such as production management, computer methods, behavioral science and political science is to trade off existing courses. The only ones that can be traded are electives, since removal of other courses would create a deficiency in the curriculum baseline. Alternative 6A provides for substituting two of four new courses for the two electives.

Alternatives 6 and 6A can become essentially the same alternative. Production management, computer methods, behavioral science, or political science courses could be offered as "structured" rather than "free" electives, by giving the students the opportunity to select two of the four. However, since there is only sufficient time for two electives in the entire curriculum, it may be of greater value to let the students choose courses that will best meet their individual requirements.

Alternatives 6B and 6C do not include a refresher period. Since the calculus and computer programming courses given during the refresher would have to be taken during the first quarter, two courses must be deleted from the current curriculum. Either two electives (alternative 6B) or one elective and one quarter of the thesis preparation time (alternative 6C) could be sacrificed; however, this would

be of no advantage, since both alternatives would provide less coverage than the current curriculum.

2. Seven-Quarter Alternative Model (Figure 4-4)

Extending the curriculum to seven quarters provides greater flexibility in structuring courses. Alternatives 7A and 7B allow for a full-quarter experience tour and either two electives or two new courses in the production management, computer methods, behavioral science, or political science areas. In Alternative 7B and others that will follow, selection of any two courses from the four new course areas is a decision that should be made by the students.

Further trade-offs can be made within the seven-quarter time-frame which will provide for more alternatives in course offerings. Reducing the experience tour to one-half quarter will enable two electives plus two of the four new courses to be given (Alternative 7C). All four new courses can be offered if the two electives are eliminated (Alternative 7D).

Deletion of the refresher period requires elimination of all electives and new courses (Alternative 7E) or reduction of the experience tour to one-half quarter. The additional flexibility that can be achieved by using the one-half quarter experience tour is the ability to trade off between electives and new courses (Alternatives 7F and 7G).

Alternative 7C appears to be the most desirable, since it includes a balance between the experience tour, electives, and new courses.

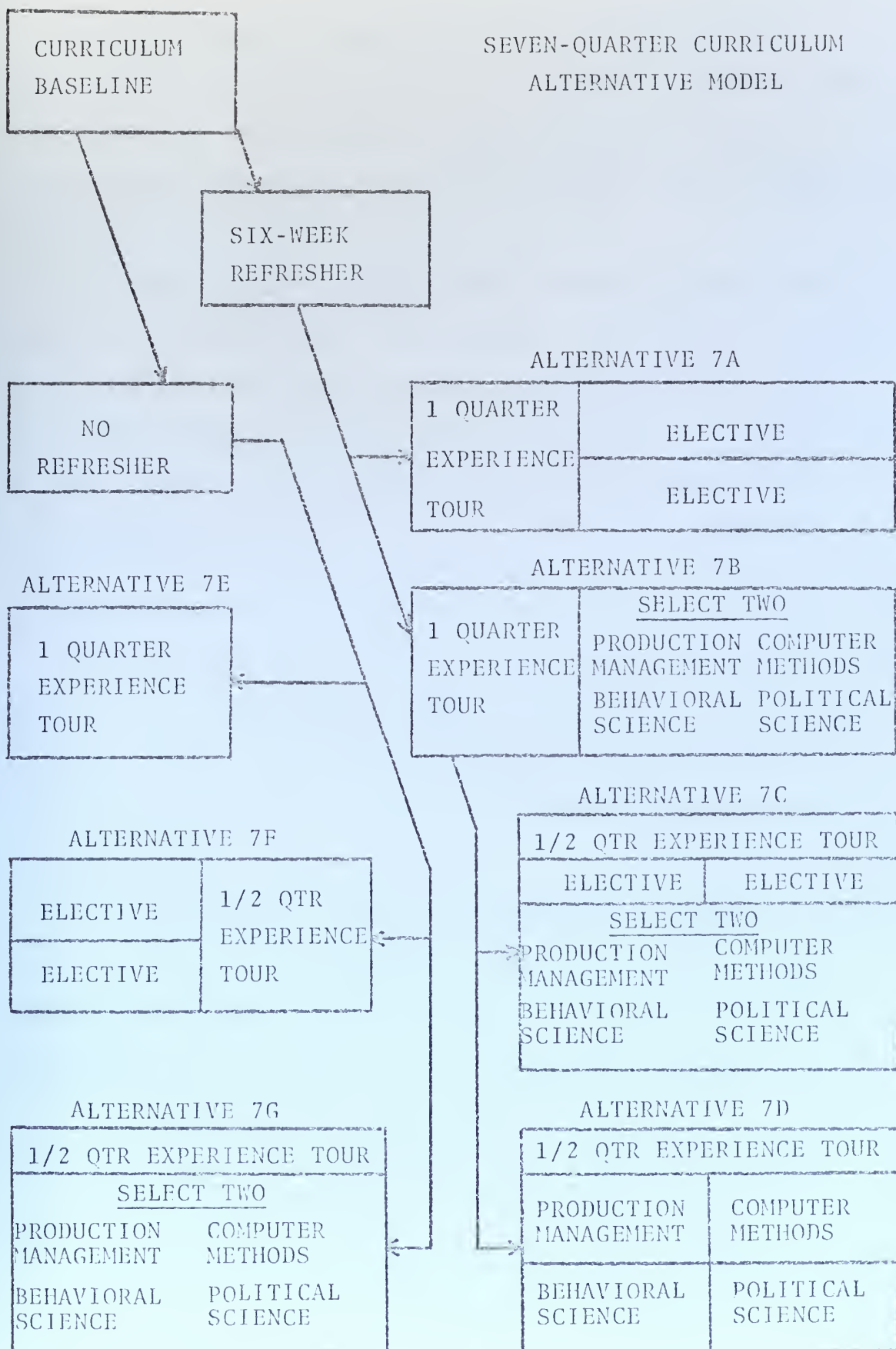


FIGURE 4-4

3. Eight-Quarter Alternative Model (Figure 4-5)

Alternative 8A provides the maximum benefit within the parameters established for this analysis, since a full-quarter experience tour, two electives and all four new courses can be offered.

Deleting the refresher and holding the one-quarter experience tour constant will produce the trade-off between electives and new courses shown in Alternative 8B. Alternative 8C provides the same range of coverage as Alternative 8A, but requires the sacrifice of one-half quarter from the experience tour.

D. EVALUATION OF ALTERNATIVES

Some alternatives within the six, seven and eight-quarter models demonstrate greater benefit than others. It is now appropriate to compare all of the alternatives together, in an effort to define which ones offer the greatest increase in value for the students.

1. Comparison of Curriculum Alternative Models

Figure 4-6 compares the model alternatives and establishes a measure of value for each one. The following assumptions are made in computing these values:

- There are four variables:
 - Six-week refresher
 - Elective courses
 - Experience tour
 - New courses
- Establishing a positive or negative value is based solely on whether a variable is included or excluded.

EIGHT-QUARTER CURRICULUM ALTERNATIVE MODEL

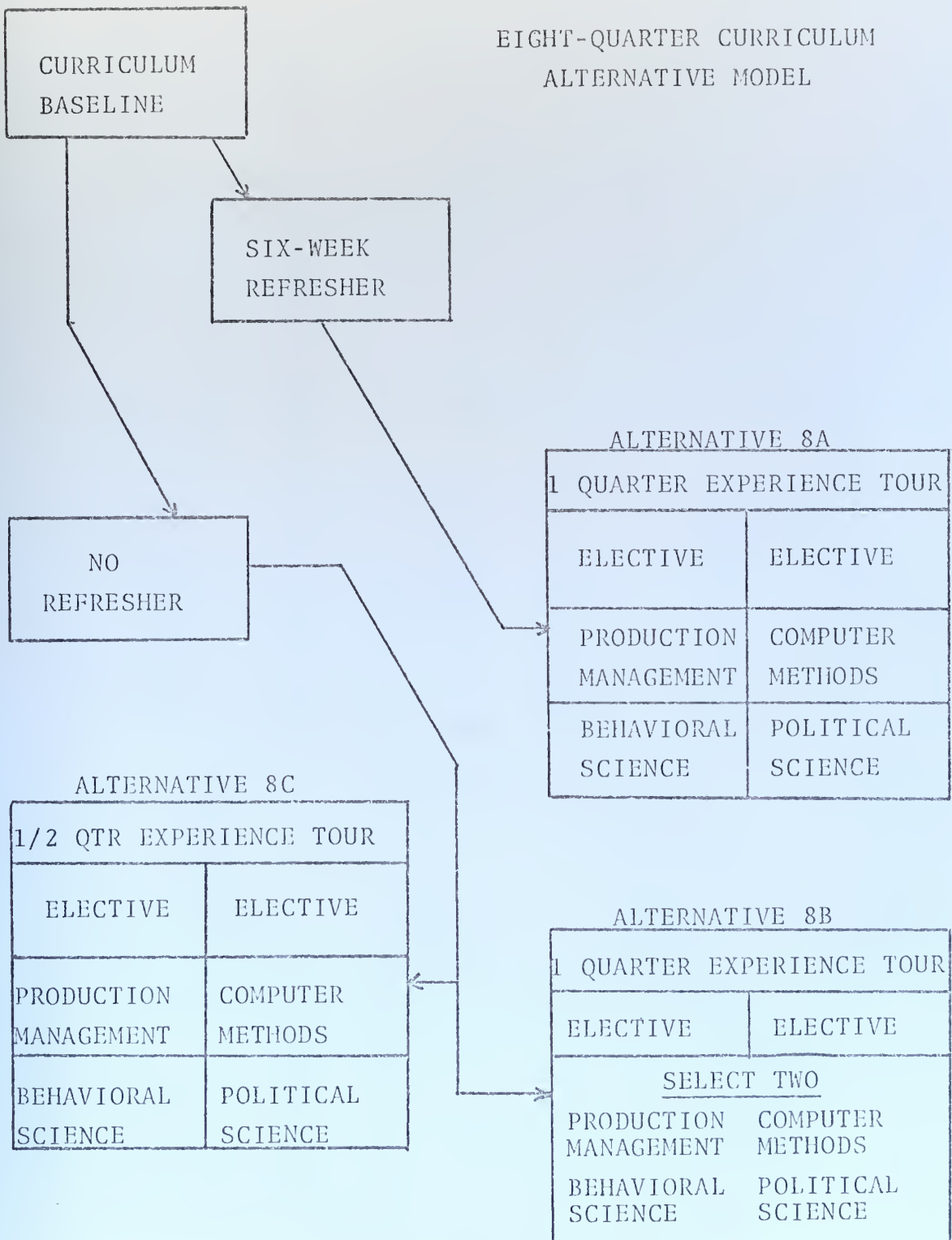


FIGURE 4-5

COMPARISON OF ALTERNATIVES

ALT. RANK

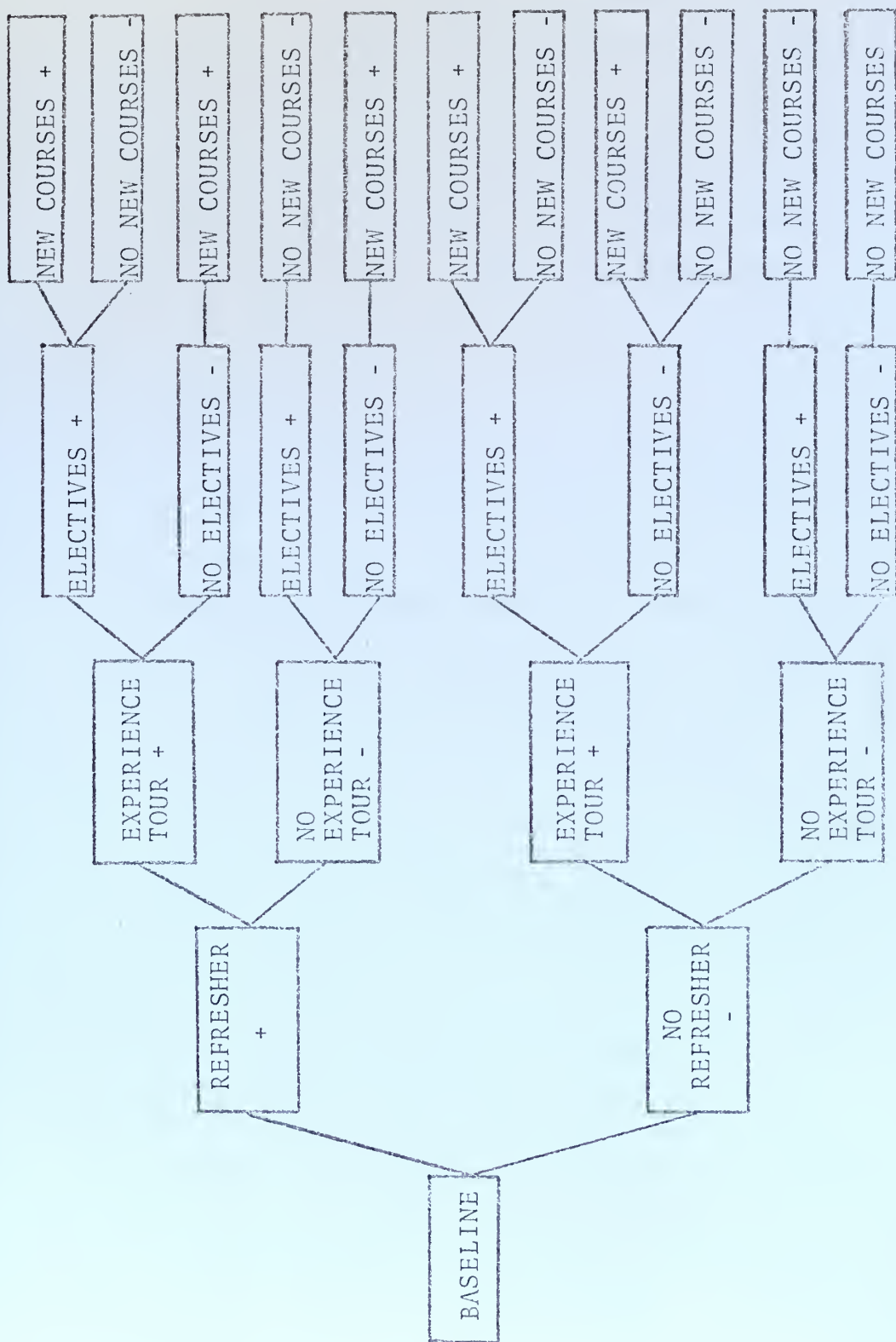


FIGURE 4-6

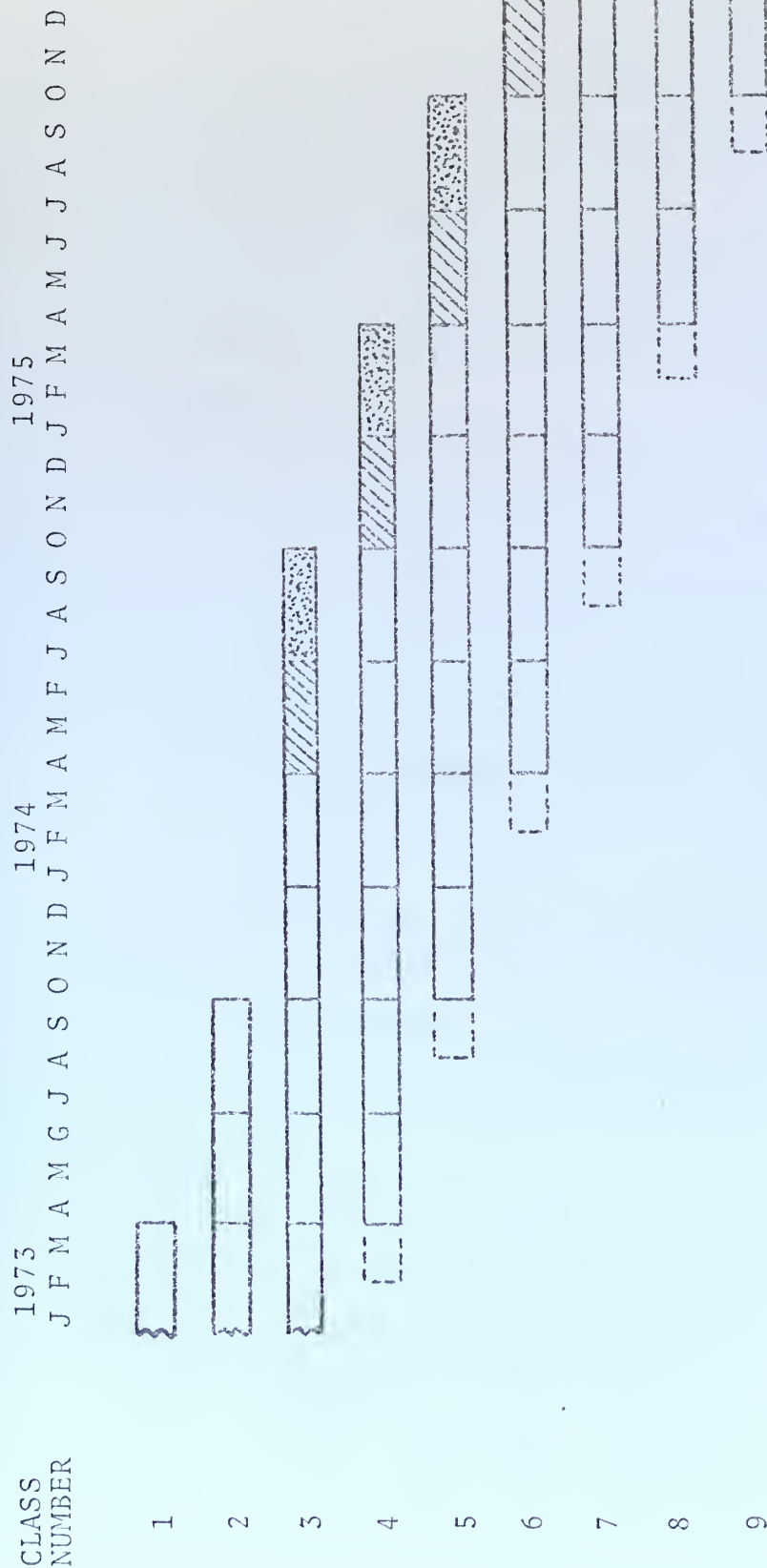
- A preference ranking for each alternative is computed by summing the positive and negative values. Since the baseline is common to all alternatives, it has a zero value for scoring purposes.
- Although ranking scores can be compared, it is not suggested that a plus four is worth twice as much as plus two, or that a plus two has twice the value of zero.

2. Time Comparison

Commencing in September 1971, two classes of approximately 25 students each per year were scheduled to convene on a continuing basis. After arrival of the third class in September 1972, a total of 75 SAM students will be assigned at all times, except for overlap periods when a new class is attending the six-week refresher. During these periods 100 students will be enrolled. Changing the curriculum to either seven, or one of the eight-quarter options will in turn change the number of students enrolled at any one given point in time and consequently change the dates of graduation.

Figure 4-7 displays when SAM classes will begin and are to be graduated for the six, seven and eight-quarter options. For purposes of illustration, Class #3 has been selected as the first class that could be changed to a seven or eight-quarter program. The numbers of students

SIX, SEVEN AND EIGHT-QUARTER CURRICULUM ALTERNATIVES



- SIX-WEEK REFRESHER
- SEVENTH QUARTER
- EIGHTH QUARTER

FIGURE 4-7

enrolled in the SAM program per month, at any time during the period 1973 through 1975, can be calculated by summing the classes and multiplying by the number of students per class. Further summing over a 12-month period produces total student-months per year.

The total number of student-months per year for each option is compared with the present six-quarter curriculum in Table IV-2.

Deletion of the six-week refresher from the seven and eight-quarter options from the September 1972 and following classes will create a student-month saving in fiscal year 1973, as compared with the present six-quarter curriculum, and have a zero effect in fiscal year 1974. The student-month totals shown for fiscal year 1975 will apply to 1976 and thereafter.

3. Cost Comparison

The number of student-months per year can be considered a cost measurement. Figure 4-1 listed four elements to be considered in establishing the cost of a graduate education:

- Student salaries
- Extra cost of experience tour
- NPS administrative costs
- Faculty salaries

Cost of student salaries and extra cost of experience tours for travel and per diem allowances will be the only ones

TABLE IV-2

STUDENT MONTHS PER YEAR BY CURRICULUM OPTION

CURRICULUM OPTION	STUDENT-MONTHS PER YEAR			STUDENT-MONTHS PER YEAR FOR 6 QTR OPTION			INCREASE IN STUDENT MONTHS PER YEAR		
	FY 73	FY 74	FY 75	FY 73	FY 74	FY 75	FY 73	FY 74	FY 75
6 QTR W/REFR									
7 QTR W/O REFR	825	975	1050	900	975	975	(75)	0	75
7 QTR W/REFR	900	1050	1125	900	975	975	0	75	150
8 QTR W/O REFR	825	975	1200	900	975	975	(75)	0	225
8 QTR W/REFR	900	1050	1275	900	975	975	0	75	300

considered in this analysis since they are subject to greater variability between alternatives. The latter two categories will be held constant.

The additional cost of experience tours for two classes of 25 students per year will be:

- 85 student-months per year for a full quarter experience tour, or
- 48 student-months per year for a half-quarter experience tour.

Since the fiscal year 1975 student-month totals from Table IV-2 will apply to the years following, it will be considered normal for purposes of further evaluation.

4. Content - Time - Cost Analysis

Table IV-3 identifies each curriculum alternative to a cost in student-months per year. This cost includes the fiscal year 1975 totals by curriculum option from Table IV-2 added to either 48 or 85 student months, depending upon the duration of the experience tour.

The table also provides a means for making content-time-cost trade-offs, which can be summarized as follows:

- Although Alternatives 6B and 6C cost less than the current curriculum, dropping the six-week refresher would create the necessity for offering the refresher courses during the first quarter and thereby displacing two courses later on in the program. Neither provides a viable solution

TABLE IV-3
CURRICULUM VALUE - COST COMPARISON

<u>CURRICULUM ALTERNATIVE</u>	<u>TOTAL VALUE</u>	<u>COST IN STUDENT MONTHS</u>
6	0	975
6A	0	975
6B	-4	900
6C	-2	900
7A	2	1210
7B	2	1210
7C	4	1173
7D	2	1173
7E	-2	1135
7F	0	1098
7G	0	1098
8A	4	1360
8B	2	1285
8C	2	1285

to improving the present time-constrained curriculum, since the cost savings would be offset by the decrease in value.

- Alternative 7C offers the maximum benefit within seven quarters by providing for two electives and two new courses, in addition to the experience tour. It is superior to Alternatives 7A and 7B in both value and cost, and is preferable to 7D in value because of providing for electives.
- Alternatives 7E, 7F and 7G offer no gain in value and cost more than the present six-quarter curriculum. Although they cost less than Alternative 7C, their low value ranking precludes their being considered viable solutions.
- Alternative 8A provides the maximum benefit within the eight-hour time frame. However, it has the highest cost of any of the alternatives.
- Alternatives 8B and 8C cost less than 8A, but they have less value than 8A and 7C and cost more than any of the seven-quarter alternatives.

5. Final Trade-Off

Alternatives 7C and 8A are superior in value to any of the other alternatives discussed. The final trade-off decision between these two becomes very difficult for the following reasons:

- The real benefit of the additional half-quarter of experience tour and two more courses offered

by Alternative 8A cannot be accurately compared with the cost and time advantages of Alternative 7C.

- There are uncertainties other than curriculum, time, and cost which will affect selection of the optimal curriculum:
- Although project managers have favored the experience tour and most seem to prefer a full quarter, their willingness to have students assigned to their offices on a continuing basis is untested.
- The attitude of students toward the six or twelve-week experience tour will depend upon their personal opinion. Some may consider the tour to be an opportunity only if it meets their own definition of reasonable duration, whereas others may not favor the concept at all because of personal reasons such as family separation.
- Approval by Naval Postgraduate School, Bureau of Naval Personnel, and Naval Material Command Headquarters must be granted before the curriculum length can be changed or experience tour provided.
- Funds must be made available to keep students in school for a longer duration and to provide for the experience tour.

V. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Comparison of curriculum alternatives from Chapter IV, in terms of content, time and cost, lead to the following conclusions:

- . An experience tour should be added to the SAM Curriculum. It will provide a significant increase in curriculum value, by exposing the student to the experience of the real-world environment that can be applied directly to remaining SAM courses, the group thesis, and future project management assignments. This concept has wide support by project managers and senior staff officials, other managers who support project organization, and the NPS SAM Curriculum committee.
- Extending the present curriculum to at least seven quarters will be required to provide for an experience tour and the addition of any new courses. Including the refresher period will assure that a minimum of two electives can be provided, whereas its exclusion will degrade the course offerings.
- Extension beyond seven quarters will result in greater cost with no assurance of greater benefit for the students.

- Optimization of the curriculum can be achieved through experimentation. An action plan is provided in the following pages.

B. RECOMMENDATIONS

The authors recommend expanding the curriculum to include an experience tour but recognize that the concept must be tested prior to extending the curriculum on a permanent basis. Ultimate success can be guaranteed only if the curriculum sponsors, project managers, NPS faculty, and SAM students all concur that the benefits from the tour merit the expenditure of extra time and cost.

Table V-1 proposes a plan that will best the experience tour concept and the value of adding new courses to the curriculum. It is recommended that this plan be implemented, using the third class of SAM students. They will enter the curriculum in September 1972 and would normally graduate in March 1974. Adding one quarter would change their graduation to June 1974.

The experience tour should be scheduled during the fifth quarter, which will be October through December 1973. By that time, the class will have been exposed to most of the required academic disciplines, and will still have sufficient time to apply the knowledge acquired during the tour to the remaining courses and group thesis.

The experiment will have greater student support if they are given the option to select the experience tour or

TABLE V-1

A TEST PLAN FOR IMPROVING THE SAM CURRICULUM

- FOURTH QUARTER

- Give one class of students the option of being assigned to an experience tour during the fifth quarter or taking electives approved by the SAM Curriculum committee.
- The group thesis can be started during this quarter.

- FIFTH QUARTER

- Experience Tour Option - assign students to project organizations of their own preference wherever possible.
- Elective Course Option - students select courses not presently offered in the SAM Curriculum, with preference being given to those areas which have been expressed as deficient in the present curriculum (production management, computer methods, behavioral science, and political science).
- End of the Quarter - students present initial evaluation of their selected option. Project managers can supplement this information by expressing their comments as to the effectiveness and duration of the experience tour.

- SIXTH AND SEVENTH QUARTER

- Faculty - can observe the differences in performance between students assigned to experience tours vs. students who remained at NPS during the fifth quarter, both in courses and in the group thesis.
- Students - can give their final evaluation as to the value and duration of the experience tour, as opposed to taking additional courses.

to take additional courses. It will be necessary, however, to extend the whole class to seven quarters in order to assure that those who go on experience tours do not get out of phase with the rest of the students in the class.

Extending this particular class to graduation in June should provide an incentive for the students participating in the experiment. They will have greater choice in their next assignment, since the highest percentage of transfers occur during the summer months, and summer rotations normally have a greater acceptance from a family point of view.

Another incentive factor for students participating in the test will be soliciting their support in developing criteria for evaluating the effectiveness of the option chosen. Since they are the ones who will be participating in the test, establishing their reaction to either option should not present a significant problem. However, analyzing the degree of benefit within and among the options may be quite difficult. Trade-off decisions will have to be made by some means to establish which of the following will be the optimum long-term decision:

- Provide for a full-quarter experience tour
 - leaving the curriculum at a length of seven quarters (Alternative 7A or 7B).
 - adding another term to provide for additional courses (Alternative 8A).
- Provide for a half-quarter experience tour, using the remainder of the quarter for two additional courses (Alternative 7C).

- Delete the experience tour and use the extra quarter for additional courses. (This would be a new alternative.)
- Delete the experience tour, keeping the present six-quarter curriculum (Alternative 6).

Based upon the results of the experiment, action can be initiated by Naval Postgraduate School to request the appropriate changes to the Systems Acquisition Management curriculum from the Bureau of Naval Personnel and Naval Material Command Headquarters.

The authors have established these recommendations based upon personal experience, analysis, and comments by experienced faculty and senior project management officials.

The need for providing the best possible education for Navy Project Managers of the future cannot be compromised, and the cost of conducting the recommended test is minimal compared to the potential long-term benefit that could be achieved through expanding the SAM Curriculum.

APPENDIX A: CHRONOLOGY OF KEY EVENTS

- October 1969 - Chief of Naval Material addresses the requirement for officer personnel qualified in weapons systems acquisition management.
- December 1969 - Chief of Naval Operations directs review of management courses at the Naval Postgraduate School to ensure they reflect specific expertise required by Navy Project Managers operating in Washington, D. C.
- April 1970 - Chief of Naval Personnel requests that a graduate education curriculum for project managers be developed by the Naval Postgraduate School.
- July 1970 - Naval Postgraduate School completes development of an 18-month Systems Acquisition Management Curriculum utilizing a sequence of established courses.
- January 1971 - Management Program Objectives Conference conducted at Naval Postgraduate School. Chief of Naval Personnel approves establishment of Systems Acquisition Management Curriculum #816 for implementation in September 1971.
- September 1971 - Revised curriculum complete. Course of instruction implemented.

APPENDIX B: QUESTIONNAIRE

NAVAL POSTGRADUATE SCHOOL
Monterey, California 93940

In reply refer to
NC4(55Kx)/ven
23 April 1971

From: Superintendent, Naval Postgraduate School,
Monterey, California

To:

Subj: Weapons Systems Acquisition Management Questionnaire

Ref: (a) Chief of Naval Personnel ltr Ser C313/92 of
28 Jan 1971 (NOTAL)

Encl: (1) Questionnaire

1. Filling out enclosure (1) will require about one-half hour of your time, but it will be an important half hour. We are requesting your professional opinion. The objective of this questionnaire is to provide information for the formulation of the best mix of courses for a graduate curriculum in Weapons Systems Acquisition Management (WSAM).
2. By reference (a), the Naval Postgraduate School (NPS) was given official approval to institute a six-quarter course in Weapons Systems Acquisition. A student group is researching the problem of designing the course content. The first BuPers selected input of 24 officers will arrive for the September 1971 class. It is the goal at NPS to provide each officer with an academic preparation which will apply directly to his future work in the Navy's weapons systems acquisition management business.
3. You can understand the importance of properly educating an officer before he is assigned that duty. You were selected to receive this questionnaire because you are considered one of the few people in the Navy who can professionally comment on the requirements of a weapons systems acquisition manager. If you had the choice of attending a curriculum such as the one being designed, or if you could choose the curriculum which would best prepare your assistants, which preferences would you make? Your conscientious reply to the questionnaire is essential to the successful implementation of the best WSAM curriculum at NPS.

4. The Chief of Naval Materiel (MAT 02), as sponsor of the WSAM curriculum, has encouraged the distribution of this questionnaire. We would appreciate return of enclosure (1) in the self-addressed return envelope to meet our milestone date of 10 May 1971.

5. Thank you for your cooperation and assistance.

F. H. BURNHAM
By direction

QUESTIONNAIRE

Notes:

1. A survey of weapons systems acquisition managers/project managers was conducted in late December 1969 and early January 1970 in conjunction with studies undertaken elsewhere in the Navy to improve project management.
2. The study was conceived and the questionnaire constructed in the Active Officer Plans Branch of the Bureau of Naval Personnel. The Chief of Naval Materiel distributed it. The Active Plans Branch tabulated and analyzed the results.
3. This questionnaire focuses on the curriculum for weapons systems acquisition management. Your preferences will assist us in choosing the most pertinent subject elements for the courses to be offered. There is room for specific comments at the end of each subject area. Your response will be carefully considered. It will be a contribution to the improved education preparation for Weapons System Acquisition managers of the future.

Definitions:

1. Subject Areas: course study areas to be considered for one or more courses of instruction.
2. Elements: a listing of topics pertinent to their respective subject areas.

Instructions:

1. Indicate your evaluation of each element with an "X" on the 0-10 scale to the right of each element. The first page lists the subject areas. The breakdown of elements in each subject area follows. The final page is a personal experience inquiry designed to provide a meaningful data base.
2. Space is provided at the end of each subject area for your specific comments, such as:

- a. additions to the list of elements.
 - b. comments regarding specific problems encountered which may have been alleviated if the individual concerned had been given the benefit of an education in the subject area/elements listed.
 - c. specific remarks to amplify your feelings about subject area in general, or regarding any listed or added element.
 - d. cautions you consider noteworthy in adapting the elements to a classroom environment.
 - e. suggestions for implementing specific elements.
 - f. any other comment you consider pertinent.
3. If additional room is needed for comments, use the reverse side of the page.

SUBJECT AREAS

	0	1	2	3	4	5	6	7	8	9	10
A. General Management											
B. Financial Management											
C. Procurements and Contract Administration											
D. Acquisition (Project) Management											
E. Personnel Management											
F. Resource Management											
G. Technical Management											
H. Data Management											
I. Production Management											
J. Operations Analysis											
K. Behavioral Sciences											
L. Economics											
M. Political Science											
N. Marketing											

Comments: _____

A. GENERAL MANAGEMENT

	0	1	2	3	4	5	6	7	8	9	10
1. Management principles and functions											
2. Organization structures											
3. Leadership											
4. Line and staff											
5. Management planning and control											
6. Management Styles											
7. The role of the manager											
8. Responsibility, authority, delegation											

B. FINANCIAL MANAGEMENT

	0	1	2	3	4	5	6	7	8	9	10
1. PPBS											
2. Budgeting											
3. Relationships with BOB and GAO											
4. Appropriations											
5. Cost estimation											
6. Accounting											
7. Auditing											
8. Financial reporting											

C. PROCUREMENT AND CONTRACT ADMINISTRATION

	0	1	2	3	4	5	6	7	8	9	10
1. Procurement policies and practices											
2. ASPR											
3. Legal aspects											
4. Procurement planning											
5. Contracts and contracting											
6. Contract administration											
7. Incentive contracting											
8. The contracting officer											
9. Negotiation											
10. Customer/contractor relationships											
11. Pricing											
12. Changes											
13. Termination											
14. DCAS											
15. DCAA											

Comments: _____

D. ACQUISITION (PROJECT) MANAGEMENT

	0	1	2	3	4	5	6	7	8	9	10
1. Weapon Systems Acquisition											
2. System life cycle											
3. User-producer dialogue											
4. Project disciplines and their interfaces											
5. Project organization and administration											
6. The project manager											
7. Management information systems											
8. Configuration management											
9. Program reviews											
10. Cost/schedule/performance											
11. Interface management											
12. Intra project											
13. Project/functional											
14. Project/contractor											
15. Coordination within Navy											
16. Coordination with other services											
17. Coordination with DOD, Executive, Congress Offices											

(Continued)

D. ACQUISITION (PROJECT) MANAGEMENT (Continued)

	0	1	2	3	4	5	6	7	8	9	10
18. Credibility, visibility, traceability											
19. Work study											
20. Scheduling techniques											
21. Change control											
22. Risk analysis											
23. Project approval process											
24. Priority systems											

Comments: _____

E. PERSONNEL MANAGEMENT

	0	1	2	3	4	5	6	7	8	9	10
1. Organization and staffing											
2. Leadership											
3. Line and staff											
4. Training and development											
5. Performance evaluation											
6. Selection and classification											
7. Industrial relations											
8. Labor relations											

F. RESOURCE MANAGEMENT

	0	1	2	3	4	5	6	7	8	9	10
1. Resource Management Systems											
2. PPBS											
3. Prime											
4. Logistic support											
5. Facilities management											
6. Cost-effectiveness											
7. Cost estimation											

(Continued)

F. RESOURCE MANAGEMENT (Continued)

	0	1	2	3	4	5	6	7	8	9	10
8. Life cycle costing											
9. CSCSC/TPM											
10. Risk analysis											

Comments: _____

G. TECHNICAL MANAGEMENT

	0	1	2	3	4	5	6	7	8	9	10
1. Systems engineering											
2. System integration											
3. Concept formulation/ system definition											
4. Engineering development and design											
5. System effectiveness-- reliability/maintain- ability/availability/ dependability/ capability											
6. Design/logistics interfaces											
7. Configuration and technical data management											
8. Integrated logistic support											
9. Design reviews											
10. Risk Analysis											
11. Technical Performance Management											

Comment: _____

H. DATA MANAGEMENT

	0	1	2	3	4	5	6	7	8	9	10
1. Computers and their use											
2. Management information systems											
3. Effective use of data											
4. Data formats											
5. Data banks											

Comments: _____

I. PRODUCTION MANAGEMENT

	0	1	2	3	4	5	6	7	8	9	10
1. Scheduling techniques											
2. Reporting											
3. Customer/contractor relationships											
4. Changes											
5. Configuration control											
6. FACR											
7. Quality assurance											
8. Value engineering											
9. DCAS											

(Continued)

I. PRODUCTION MANAGEMENT (Continued)

	0	1	2	3	4	5	6	7	8	9	10
10. Inspection and acceptance											
11. Industrial engineering											
12. Industrial labor problems											

Comments: _____

J. OPERATIONS ANALYSIS

	0	1	2	3	4	5	6	7	8	9	10
1. The operational need											
2. Operational need/threat-- mission analysis											
3. Operations analysis											
4. Systems analysis											
5. Operations research methods											
6. Decision analysis											
7. System effectiveness analysis											
8. Probability and statistics											
9. Uncertainty and the use of expert judgment											
10. Risk analysis											

Comments: _____

K. BEHAVIORAL SCIENCES

	0	1	2	3	4	5	6	7	8	9	10
1. Leadership											
2. Motivation and personality											
3. Managerial characteristics and styles											
4. Interpersonal dynamics											
5. Group behavior											
6. Organization theory											
7. Individual productivity											
8. Rewards and incentives											

Comments: _____

L. ECONOMICS

	0	1	2	3	4	5	6	7	8	9	10
1. Introduction to economics											
2. Macroeconomics											
3. Microeconomics											
4. Economics of defense											
5. Systems analysis											
6. Cost estimating techniques											
7. Cost estimation relationships											
8. Cost-effectiveness											
9. Cost of change											
10. Risk analysis											

Comments: _____

M. POLITICAL SCIENCE

	0	1	2	3	4	5	6	7	8	9	10
1. Strategy, tactics, and logistics											
2. The international environment											
3. The national environment											
4. National security policy											
5. Relationships with DOD, Executive Offices, BOB, GAO, Congress											
6. The Social, Political, Economic Environment											

Comments: _____

N. MARKETING

	0	1	2	3	4	5	6	7	8	9	10
1. Selling your program											
* Within the Navy											
*To CNM/CNO											
*To your superiors											
*To your subordinates											
* To DDR and E and OASD offices											
* To Congress											
2. Marketing by industry											
3. Military/industry relationships											
4. Program approval											
5. Program priorities											

Comments: _____

PERSONAL EXPERIENCE

1. I have been a Navy weapons systems acquisition manager (at)(above)(below) the project manager level for the length of time indicated:

<u>Project</u>	<u>Months</u>	<u>Billet "P" Code/Designator</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

2. My grade/designator is: _____; Years commissioned service: _____.

3. My educational experience is (college, major, # yrs. completed/graduated):

a. Undergraduate: College: _____
Major: _____ # yrs. completed _____
graduated _____

b. Graduate: College: _____
Major: _____ # yrs. completed _____
graduated _____

c. P code(s) assigned: _____

4. My present position description is: _____

APPENDIX C: RESULTS OF THE QUESTIONNAIRE

Relative Ranking of Means		
The major category is	Mean	Standard
General Management	Response	Deviation
*****	7.33	2.65
Financial Management		
*****	8.49	1.75
Procurement and Contract Administration		
*****	8.17	1.90
Project Management		
*****	8.97	1.39
Personnel Management		
*****	5.27	2.60
Resource Management		
*****	7.36	2.09
Technical Management		
*****	7.42	2.13
Data Management		
*****	6.55	2.25
Production Management		
*****	6.88	2.21
Operations Analysis		
*****	5.82	2.68
Behavioral Sciences		
*****	4.62	2.97
Economics		
*****	5.50	2.97
Political Science		
*****	4.43	2.75
Marketing		
*****	6.34	3.15

Relative Ranking of Means

The major category is

GENERAL MANAGEMENT

Subcategory	Management Principles and Functions
*****	*****
Subcategory	Organization Structures
*****	*****
Subcategory	Leadership
*****	*****
Subcategory	Line and Staff
*****	*****
Subcategory	Management Planning and Control
*****	*****
Subcategory	Management Styles
*****	*****
Subcategory	The Role of the Manager
*****	*****
Subcategory	Responsibility, Authority, Delegation
*****	*****

Relative Ranking of Means

The major category is

FINANCIAL MANAGEMENT

PPBS

Subcategory

Budgeting

Subcategory

Relationships with BOB and GAO

Subcategory

Appropriations

Subcategory

Cost Estimation

Subcategory

Accounting

Subcategory

Auditing

Subcategory

Financial Reporting

Subcategory

Relative Ranking of Means

The major category is		PROCUREMENT AND CONTRACT ADMINISTRATION	
Subcategory	*****	Procurement Policies and Practices	*****
Subcategory	*****	ASPR	*****
Subcategory	*****	Legal Aspects	*****
Subcategory	*****	Procurement and Planning	*****
Subcategory	*****	Contracts and Contracting	*****
Subcategory	*****	Contract Administration	*****
Subcategory	*****	Incentive Contracting	*****
Subcategory	*****	The Contracting Officer	*****
Subcategory	*****	Negotiation	*****
Subcategory	*****	Customer/Contractor Relationships	*****
Subcategory	*****	Pricing	*****
Subcategory	*****	Changes	*****
Subcategory	*****	Termination	*****

(Continued)

Relative Ranking of Means

The major category is PROCUREMENT AND CONTRACT ADMINISTRATION (Continued)

Subcategory ***** DCAS *****

Subcategory ***** DCAA *****

Relative Ranking of Means

PROJECT MANAGEMENT	
The major category is	
Subcategory	Weapons Systems Acquisition *****
Subcategory	System Life Cycle *****
Subcategory	User-Producer Dialogue *****
Subcategory	Project Disciplines and their Interfaces *****
Subcategory	Project Organization and Administration *****
Subcategory	The Project Manager *****
Subcategory	Management Information Systems *****
Subcategory	Configuration Management *****
Subcategory	Program Reviews *****
Subcategory	Cost/Schedule/Performance *****
Subcategory	Interface Management *****
Subcategory	Intra Project *****
Subcategory	Project/Functional *****

(Continued)

Relative Ranking of Means

The major category is PROJECT MANAGEMENT (Continued)

Subcategory	Project/Contractor
*****	*****
Subcategory	Coordination within the Navy
*****	*****
Subcategory	Coordination with Other Services
*****	*****
Subcategory	Coord. w/DOD, Executive Offices & Congress
*****	*****
Subcategory	Credibility, Visibility and Traceability
*****	*****
Subcategory	Work Study
*****	*****
Subcategory	Scheduling Techniques
*****	*****
Subcategory	Change Control
*****	*****
Subcategory	Risk Analysis
*****	*****
Subcategory	Project Approval Process
*****	*****
Subcategory	Priority Systems
*****	*****

Relative Ranking of Means

The major category is	PERSONNEL MANAGEMENT
Subcategory	Organization and Staffing
Subcategory	Leadership
Subcategory	Line and Staff
Subcategory	Training and Development
Subcategory	Performance and Evaluation
Subcategory	Selection and Classification
Subcategory	Industrial Relations
Subcategory	Labor Relations

Relative Ranking of Means

The major category is RESOURCE MANAGEMENT

Subcategory Resource Management Systems *****

Subcategory PPBS *****

Subcategory Prime *****

Subcategory Logistic Support *****

Subcategory Facilities Management *****

Subcategory Cost-Effectiveness *****

Subcategory Cost-Estimation *****

Subcategory Life Cycle Costing *****

Subcategory CSCSC/TPM *****

Subcategory Risk Analysis *****

Relative Ranking of Means

```

The major category is ***** TECHNICAL MANAGEMENT *****
Subcategory ***** System Integration *****
Subcategory ***** Concept Formulation/System Defn. *****
Subcategory ***** Engineering Development and Design *****
Subcategory ***** System Effectiveness - Maintainability *****
Subcategory ***** Design/Logistics Interfaces *****
Subcategory ***** Configuration and Technical Data Management *****
Subcategory ***** Integrated Logistic Support *****
Subcategory ***** Design Reviews *****
Subcategory ***** Risk Analysis *****
Subcategory ***** Technical Performance Management *****
```


Relative Ranking of Means

```

The major category is          DATA MANAGEMENT

Subcategory                    Computers and their Use
*****

Subcategory                    Management Information Systems
*****

Subcategory                    Effective Use of Data
*****

Subcategory                    Data Formats
*****

Subcategory                    Data Banks
*****
```


Relative Ranking of Means

The major category is PRODUCTION MANAGEMENT

Subcategory ***** Scheduling Techniques *****

Subcategory ***** Reporting *****

Subcategory ***** Customer/Contractor Relationships *****

Subcategory ***** Changes *****

Subcategory ***** Configuration Control *****

Subcategory ***** FACR *****

Subcategory ***** Quality Assurance *****

Subcategory ***** Value Engineering *****

Subcategory ***** DCAS *****

Subcategory ***** Inspection and Acceptance *****

Subcategory ***** Industrial Engineering *****

Subcategory ***** Industrial Labor Problems *****

OPERATIONS ANALYSIS

```

Subcategory *****
The Operational Need *****
Operational Need/Threat-Mission Analysis *****
Operations Analysis *****
Systems Analysis *****
Operations Research Methods *****
Decision Analysis *****
System Effectiveness Analysis *****
Probability and Statistics *****
Uncertainty and the Use of Expert Judgment *****
Risk Analysis *****
Subcategory *****

```


Relative Ranking of Means

The major category is		BEHAVIORAL SCIENCES
Subcategory	Leadership	*****
Subcategory	Motivation and Personality	*****
Subcategory	Managerial Characteristics and Styles	*****
Subcategory	Interpersonal Dynamics	*****
Subcategory	Group Behavior	*****
Subcategory	Organization Theory	*****
Subcategory	Individual Productivity	*****
Subcategory	Rewards and Incentives	*****

Relative Ranking of Means

The major category is

ECONOMICS

Subcategory ***** Introduction to Economics *****

Subcategory ***** Macroeconomics *****

Subcategory ***** Microeconomics *****

Subcategory ***** Economics of Defense *****

Subcategory ***** Systems Analysis *****

Subcategory ***** Cost Estimating Techniques *****

Subcategory ***** Cost Estimation Relationships *****

Subcategory ***** Cost-Effectiveness *****

Subcategory ***** Cost of Change *****

Subcategory ***** Risk Analysis *****

Relative Ranking of Means

The major category is POLITICAL SCIENCE

Subcategory Strategy, Tactics, and Logistics

Subcategory The International Environment

Subcategory The National Environment

Subcategory National Security Policy

Subcategory Relationships with DOD, Exec Offices, & BOB

Subcategory Social, Political, Economic Environment

Relative Ranking of Means

The major category is

MARKETING

Subcategory ***** Selling Your Program *****
Subcategory ***** Within the Navy *****
Subcategory ***** To CNM/CNO *****
Subcategory ***** To Your Superiors *****
Subcategory ***** To Your Subordinates *****
Subcategory ***** To DDR and E and DASD Offices *****
Subcategory ***** To Congress *****
Subcategory ***** Marketing by Industry *****
Subcategory ***** Military/Industry Relationships *****
Subcategory ***** Program Approval *****
Subcategory ***** Program Priorities *****

APPENDIX D: SAMPLE COURSE OUTLINES

SM 4301 - Systems Engineering Management

Course objective

To provide students a detailed understanding of and experiences in technical management as applied to the Systems Acquisition Process. The course emphasized the life cycle integration of the various systems engineering disciplines.

Prerequisite

SM 3301 - Introduction to Systems Acquisition.

Course outline

- I. Introduction and Overview (2)
 - A. The need for Systems Engineering
 - B. Viewpoints of Systems Engineering
 - C. Systems Engineering and The System Life Cycle and Design Process.
- II. Systems Engineering Disciplines (14)
 - A. System Design and Integration
 - B. System/Cost Effectiveness
 - C. Reliability and Maintainability Engineering
 - D. Integrated Logistic Support
 - E. Human Factors Engineering
 - F. Safety Engineering
 - G. Test and Evaluation
 - H. Configuration Management

- I. Value Engineering
- J. Tradeoff Analysis
- K. Design Reviews
- III. Systems Engineering During Concept Formulation (6)
 - A. Mission Concept Studies
 - B. Preliminary Approach Studies
 - C. Technical Development Planning
- IV. Systems Engineering During System Definition (6)
 - A. System Functional Analysis
 - B. System Design Concept Studies
 - C. System Requirements Specification
- V. Systems Engineering During Full Scale Development (6)
 - A. Preliminary Design
 - B. Engineering Development
 - C. Detailed Design
 - D. Test and Evaluation
 - E. Production Design
- VI. Systems Engineering During Deployment (2)
 - A. Sustaining Engineering
 - B. Field Engineering
- VII. Exams, Guest Lectures, Additional Cases (8)

SM 3302 - Fundamentals of Project Management

Course objective

To provide students a detailed understanding of and classroom experiences in the Management of Systems Acquisition projects. The course emphasizes the application of management principles to the planning, organizing, staffing, directing, coordinating, and controlling the various interdisciplinary aspects of a major program.

Prerequisite

None

Course outline

- I. Introduction and Overview (3)
 - A. Review of Management Functions and Principles
 - B. The Need for Project Management
 - C. The Role of the Project Manager
- II. Planning the Project (8)
 - A. The Project Charter
 - B. Project Authority, Responsibility, and Accountability
 - C. Planning, Programming, and Budgeting as Applied to the Project.
- III. Organizing and Staffing the Project (8)
 - A. The project's internal and external interfaces and organizational needs
 - B. Organizational Forms
 - 1. The Functional Organization
 - 2. The Pure Project Organization

- 3. The Matrix Organization
 - 4. Other Organizational Forms
- C. Staffing the Project
 - 1. Military Staffing
 - 2. Civilian Staffing
 - 3. Motivation
 - 4. The effects of rotation, RIF's, and other perturbation
- IV. Directing, Coordinating and Controlling the Project (10)
 - A. Authority and Responsibility Relationships
 - B. Managerial Styles
 - C. Performance, Cost, and Schedule Measurement
 - 1. Risk assessment
 - D. Program Reviews
 - 1. Internal
 - 2. External
 - 3. Selective Acquisition Reports (SAR)
 - E. Program Changes and Their Impact
- V. Project Management in the Different Life Cycle Phases (6)
 - A. During Concept Formulation
 - 1. Planning, Organizing and Control Requirements during CF
 - 2. The Development Concept Paper (DCP)
 - 3. DSARC I
 - B. During System Definition
 - 1. Planning, Organizing, and Control Requirements during SD

2. Updating the DCP

3. Project Management During Contract Definition
Phases

4. DSARC II

C. During Full Scale Development

1. Planning, Organizing, and Control Requirements during FSC

2. Project Management during FSD

3. DSARC III

VI. Exams, Guest Lectures, and Additional Cases (9)

APPENDIX E

SYSTEMS ACQUISITION MANAGEMENT COURSE DESCRIPTIONS

SM 3301 INTRODUCTION TO SYSTEMS ACQUISITION (4-0). This course provides students with an overview of the Systems Acquisition process, its underlying philosophies and concepts, its application in the Department of Defense and the Navy, and establishes the foundations for other courses in the curriculum. Topics covered include the evolution of systems acquisition management, the systems approach, the system life cycle and defense system acquisition cycle, user-producer dialogue, Navy life cycle management philosophy, and systems acquisition management disciplines and activities. PREREQUISITE: None.

SM 3302 FUNDAMENTALS OF PROJECT MANAGEMENT (4-0). Study of the principles of management as a body of knowledge related to practice. Discusses the functions of management planning, organizing, staffing, directing, and controlling--as they apply within industry and government. Specific application of these principles and functions to project management are investigated. PREREQUISITE: None.

SM 3304 THE BEHAVIORAL SCIENCES AND PROJECT MANAGEMENT (4-0). Study of the field of behavioral science as a body of knowledge related to a concrete practice. Discusses the functions of management as they apply to the achievement of purposes by individuals and groups within an industrial or government organization. Examines various aspects of individual and group behavior and their influence on organizational effectiveness. Specific concepts include traditional contemporary management theory; individual and group dynamics; motivation and control in the organizational setting. PREREQUISITE: SM 3302.

SM 3305 PROJECT INFORMATION SYSTEMS (4-0). The course provides a fundamental grounding in computer operations. Material covered includes hardware and software systems, a survey of the various higher level programming languages, examples of computer systems applications, and the concepts of design of management information systems. Particular attention is paid to project management systems. PREREQUISITES: CS 0110, SM 3301, SM 3302.

SM 4301 SYSTEMS ENGINEERING MANAGEMENT (4-0). This course covers technical management as applied to the Systems Acquisition process. It emphasizes the life cycle integration of the various systems engineering disciplines. Topics

include systems engineering, the system life cycle and system design process, systems engineering disciplines and their integration, systems engineering management during concept formulation, system definition, full-scale development, production and deployment. PREREQUISITES: SM 3301, SM 3302, OA 4662.

SM 4302 PUBLIC EXPENDITURE, POLICY AND ANALYSIS (4-0). The process of national decision-making particularly as reflected in the defense budgeting process. Models of budget decision making, including decentralization. Application of social choice concepts. Applications from the defense budgeting process. PREREQUISITES: MN 3161, MN 4145.

SM 4303 PROCUREMENT PLANNING & NEGOTIATION (4-0). Study of the procurement planning and negotiation phases of the procurement cycle, including the determination of need, basic contract law, methods of procurement, fundamentals of the Armed Services Procurement Regulations and current procurement management techniques. PREREQUISITES: SM 3301, SM 4301 (concurrently).

SM 4304 CONTRACT ADMINISTRATION (4-0). Study of defense procurement contract administration, managing contract progress, change control, cost control, sub-contracting regulations and administration, product acceptance and contract termination. PREREQUISITE: SM 4303.

SM 4305 LOGISTIC SUPPORT (4-0). This course defines and describes the major fields of logistic support and introduces various models of logistical areas. These areas of support include: personnel, consumables, facilities, material transportation and maintenance. The field of integrated logistics support is introduced along with trade-offs between types of support in optimizing support systems. Data bases and techniques for determination of support requirements are treated briefly. PREREQUISITE: SM 4301.

SM 0810 THESIS RESEARCH FOR SYSTEMS ACQUISITION MANAGEMENT STUDENTS (0-0). Every student conducting thesis research will enroll in this course.

SM 0001 SEMINAR FOR SYSTEMS ACQUISITION MANAGEMENT STUDENTS (0-2). Guest Lecturers. Thesis and research presentations. PREREQUISITE: None.

OS 3201 FUNDAMENTALS OF OPERATIONS ANALYSIS (4-0). An introduction to quality assurance elements including design reliability assessment, production assessment testing, environmental testing, system reliability demonstration. Introduction to hardware performance measures. Introduction

to cost effectiveness analysis. Elements of probability and statistics developed as needed. PREREQUISITE: Differential and Integral Calculus.

OS 3202 METHODS OF OPERATIONS ANALYSIS/SYSTEMS ANALYSIS (4-0). Methodology of operations analysis/systems analysis. Statistical estimation, and hypothesis testing. Life testing plans, point and interval estimates and reliability parameters. Elements and systems analysis pertaining to redundancy, maintainability, and spares. The role of systems analysis in solving military problems. PREREQUISITE: OS 3201 or equivalent.

OS 3203 SURVEY OF OPERATIONS ANALYSIS/SYSTEMS ANALYSIS (4-0). A survey of the military applications of operations analysis/systems analysis techniques of particular interest to the student. The applications usually covered are selected from decision, waiting lines resource allocation, replacement, cost-effectiveness, inventory theory, and search models. The techniques needed for these applications are developed as required and usually include topics in linear programming (including the simplex method), probability theory, nonlinear programming, statistics (including Bayesian and classical), dynamic programming and simulation. PREREQUISITE: PS 3411 or equivalent.

OA 4662 SYSTEMS EFFECTIVENESS MEASUREMENT (4-0). Component and System reliability functions and their point and interval estimates under various sampling plans. Review of selected MILSTD reliability of documents and the WSEIAC reports. Reliability and System effectiveness measurement and analysis of the Fleet Ballistic Missile Weapon System and other selected Weapons systems. Measurement indices for Weapons System Effectiveness. PREREQUISITE: OA 4705 (may be taken concurrently) or equivalent.

MN 3140 ECONOMICS FOR PROJECT MANAGEMENT (4-0). Determinants of the allocation of resources and the composition of output. Consumer choice theory. Partial equilibrium analysis of the significance of market structure. Introduction to welfare economics using quantitative techniques. PREREQUISITE: MN 2030 or equivalent; calculus.

MN 3150 FINANCIAL ACCOUNTING (4-0). Study of basic postulates and principles of accounting. Specific topics include the accounting cycle, asset valuation, equities and capital structure, financial statement analysis, and elementary cost accounting. PREREQUISITE: None.

MN 3161 MANAGERIAL ACCOUNTING (4-0). Survey of cost accounting systems, including overhead costing, job order and process cost systems, variable and absorption costing, and standard costs. Emphasis is on applications of accounting data to

planning, control and decision making. Topics covered include flexible budgets, variance analysis, cost-volume-profit analysis, and incremental profit analysis. Capital budgeting is examined extensively. PREREQUISITE: MN 3150.

MN 4101 PERSONNEL MANAGEMENT AND LABOR RELATIONS (4-0). Study of the principles and practices of personnel administration in business and government organizations. A survey of the history, development and current status of labor-management relations in industry and government. Analysis of the economics of the labor market and the implications of government regulations for wages and labor-management bargaining practices. PREREQUISITES: MN 3106, MN 3141 or equivalent.

MN 4145 SYSTEMS ANALYSIS (4-0). This course will concentrate on the analysis of large-scale defense resource allocation problems, using cost-effectiveness models. Topics include: discounting, constrained optimization, estimation problems, and efficiency over time. Systems analysis case studies will be emphasized. PREREQUISITES: MN 3211 and MN 3150, MN 3130, MN 3141 or equivalent.

MN 4172 DEFENSE MARKETING (4-0). Research and study of marketing concepts and their present and future applications within the Department of Defense. Emphasis is placed on the understanding of marketing forces, intelligence, and strategy as related to DOD and Defense related industry. PREREQUISITE: MN 3211, MN 3060, MN 3030, MN 3106 or equivalent.

APPENDIX F

TERM PROJECT SUMMARY
SYSTEMS ACQUISITION MANAGEMENT

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NAVAL POSTGRADUATE SCHOOL
MONTEREY, CALIFORNIA
FACULTY ADVISOR - DR. M. B. KLINE
18 FEBRUARY 1972

This resume summarizes my ten-week term project in Washington, D. C., which was undertaken to gather information for use in further developing the Naval Postgraduate School (NPS) Systems Acquisition Management (SAM) Curriculum. I attended the two-week Naval Logistics Management School (NLMS) Weapon System Acquisition Management Baseline Course and visited both project and project-related functional organizations between 27 September and 3 December 1971.

The NLMS Baseline Course provided an introduction to the current Washington project environment and facilitated meeting managers who would be of assistance during the remainder of my tour. Observing project operations through discussions with Project Managers and their staffs provided a means for determining their primary areas of concern, defining problems, finding out how projects are organized to accomplish their objectives, establishing what management methods and styles are used, and seeing how the projects interact with others. Discussions with functional managers assisted in further clarifying the relationship between project and supporting functional constituencies. Visiting SUPSHIP Newport News, Virginia, afforded the opportunity to relate the Washington project environment to actual shipbuilding operations by attending the DLGN 36 Class QPPC, holding discussions with SUPSHIP project and contracts officers and touring the DLGN and CVAN construction sites.

Navy managers were either unaware of the existence of the NPS SAM Curriculum and/or were not familiar with the

orientation of the courses being offered. This provided the opportunity to explain our objectives, solicit ideas and request documentation from them that could be used for case studies in conjunction with the SAM courses.

The organizations visited and major topic areas discussed are displayed in the Project Topic Matrix on the following page.

The most significant common denominator among the projects is the incredible amount of change that must be faced, i.e., changes in requirements, priorities, scheduling, configuration, funding, personnel, etc. How the project organizations react to these changes and develop solutions to problems depends upon organization and staffing, urgency of the project as viewed by higher authority, and a variety of behavioral considerations. Each project, being dedicated to different tasks with different requirements, has adopted a particular management style to fit its specific needs.

Without exception, the NPS SAM Curriculum has support by those whom I met while in Washington. Everyone that I talked with cooperated to the fullest extent, both in discussing project office operations, problems being encountered, and by providing documentation and other information, as well as suggestions that will be of assistance. Considering coverage of 30 different organizational components and contact with over one hundred people, I found this to be of great significance.

PROJECT TOPIC MATRIX

	NLMS	PMS 378	PMS 380	PMS 383	PMS 389	PMS 392	PMS 399	NSHP 0161	SUP SHP (1)	PMO 403	NSP (2)	NORD 5515 (3)	02 (4)	OTHER
Policy, philosophy	X	X		X				X			X			X
Program scope, organization		X	X	X	X	X	X	X	X	X	X	X	X	X
Personnel	X	X		X	X	X		X	X	X		X		
Workload				X						X				
Decision making, uncertainty, etc.	X	X	X	X	X	X	X		X	X		X		
Training and education	X	X		X	X	X	X	X	X	X	X	X	X	X
Concepts, risk assessment, reliability, maintainability, support, etc.	X	X		X	X	X			X	X	X	X	X	X
Data Management	X		X		X					X				
Configuration management, standardization	X		X	X		X				X		X		X
Concurrency and prototyping	X						X					X		
Contracting	X	X					X	X	X		X	X	X	
Budget, cost analysis and control	X	X		X		X		X				X	X	
Interfaces with other organizations	X	X				X		X	X	X		X	X	X
Selling the Program	X						X			X	X	X		

(Continued)

PROJECT TOPIC MATRIX (Continued)

	NLMS	PMS 378	PMS 380	PMS 383	PMS 389	PMS 392	PMS 399	NSHP 0161	SUP SHP 403	PMO NSP 403	NORD 5515	02 OTHER
									(1)	(2)	(3)	(4)
Meetings, briefings and conferences	X						X		X		X	X
Construction site visit									X			
Documentation	X	X	X	X	X		X		X	X	X	X

- (1) SUPSHIP, Newport News
- (2) NATO SEASPARROW Project
- (3) PHALANX/VULCAN Program
- (4) AIR, ORD, SHIPS 02 Organization

Several concepts relating to the SAM Curriculum which had the full support by the projects were (1) assigning officer students to project experience tours, during the course of their NPS SAM educational program; (2) establishing a simulated project office environment at NPS, by assigning the students to actual roles and have them manage the acquisition of a simulated Navy system. An additional means of assuring that the curriculum is kept current with the actual project environment is to further encourage the interchange of NPS faculty and experienced project personnel, and having Project Managers continue presenting seminars at NPS.

APPENDIX G: SAMPLES OF CASE STUDY DEVELOPMENT MATERIALS

CASE 1 - A STUDY IN ORGANIZATION AND STAFFING SURFACE MISSILE SYSTEMS (SMS) PROJECT

The Surface Missile Systems Project (PMO 403) is chartered by the Naval Ordnance Systems Command, and is responsible for the management of two major programs, the SMS Weapon Systems Program and the Ship Anti-Missile Integrated Defense (SAMID) Program. These are a complex combination of missile systems which are managed by six Program Managers who report to the SMS Project Manager. Each program manager has his own staff, which is tailored organizationally to fit the specific needs of the particular program. Program Managers are designated for the TERRIER, TARTAR, TALOS, AEGIS, Point Defense and SAMID Programs.

The SMS Project organization is unique in that it has undergone two major changes since December 1969. The first change was a transition from a CNM designated project (PM 3) to a NAVORD project (PMO 403). At that time the PM 3 staff in its entirety became the PMO 403 staff.

In May 1971, as part of the NAVORD reorganization, PMO 403 was reduced in size from three hundred seven military and civilian personnel to eighty, which is the present personnel level. This resulted in a shift of support personnel from within the project to the NAVORD

functional organization. A summary of the "before" and "after" reorganization staff tally is shown below:

<u>Component</u>	<u>Before</u>	<u>After</u>
PMO 403 Staff	14	11
Plans, Programs and Resources	39	6
ILS	24	1
TERRIER	13	5
TARTAR	19	7
TALOS	7	4
AEGIS	26	22
Point Defense	10	8
SAMID	16	16
Technical Codes	139	0
	<hr/> 307	<hr/> 80

NOTE: The above figures include both military and civilian staff. There are approximately 19 officers assigned to the project at present. The Project Manager, Deputy Project Manager, Director of Plans, Programs and Resources, and five of the six Program Managers are Navy Captains.

This series of changes demonstrates an important aspect of project management. That is, as a project progresses through its life cycle, the organizational and personnel requirements will change. Its whole orientation changes as it evolves from the Research and Development stage, through production and on to modernization. This change becomes more pronounced in a conglomerate project, where many systems in different stages of development are managed by the same project organization.

As these changes occur, the project staff must adapt to a new environment. For example, the Plans, Programs

and Resources, and ILS staffs were reduced greatly and the technical codes eliminated entirely. The people were transferred to other NAVORD codes, who are now tasked with providing support to the SMS Programs. However, their services are now extended to other areas of effort as well as SMS Project. This situation calls for a different management approach to assure that the work is done, where people are no longer under the direct control of the Project Manager.

CASE 2 - A STUDY IN PROJECT ORGANIZATION AND WORKLOAD
AUXILIARY AND AMPHIBIOUS SHIP ACQUISITION PROJECT

The Auxiliary and Amphibious Ship Acquisition Project (PMS 383) is chartered by the Naval Ship Systems Command. It is considered a conglomerate in that a widely diversified number of different types of ships come under the cognizance of one project organization. The types of ships managed include: AE, AFS, AO, AOE, AOR, AD, AS, AR, AS (FBM), T-AK (FBM), LCC, LKA, FDL, AH, ARC, LPD, LSD, and BDL.

The project staff presently includes six military officers and approximately 48 civilians. There is a military Project Manager (CAPT/1400), civilian deputy (GS-15) and four Assistant Project Managers (Tenders; Amphibious, Research and Special Mission Ships, UNREP Wet Cargo; UNREP Dry Cargo). Two functional divisions support the AMP staffs (Ship System Management & Support Division; Plans and Programs Division).

PMS 383 manages the acquisition of a wider range of ship types than any other SHAPM in NAVSHIPS. The management orientation of this project is quite different from many of the others in that almost all of the ships are in the production phase, or have been delivered and are in the warranty period. This requires the project staff to deal not only with contractor, SUPSHIP and headquarters personnel, but the individual ship commissioning crews. Problems that were known but not corrected during production, as well as a whole host of new problems will surface rapidly during this period of time.

The project workload is summarized as follows:

As of 1 September 1971, there were 33 ships in the production and post-production stages (20 had been delivered, three were scheduled for delivery during the remainder of 1971 and 10 were scheduled for delivery in 1972). Of the 13 undelivered ships, six LSTs were under construction at National Steel, San Diego, California, two LSDs and two AORs at General Dynamics, Quincy, Massachusetts, and three AEs at Ingalls, Pascagoula, Mississippi.

During the 10-month period from September 1971 through June 1972, 35 separate ships trials have been scheduled (Builders, Acceptance, and Final Contract Trials). They range in number from

two to five per month. Each of the individual trials requires extensive review and analysis efforts by the project staff, and all require project personnel on site during the actual trials. Additionally, an AOR and two ASs have been authorized in the Fiscal Year 1972 Shipbuilding Program.

The management staff is confronted with many problems that arise from a workload of this magnitude and diversity, especially considering that the present organization has been in existence for a relatively short period of time. Most projects work with one contractor and SUPSHIP organization, or at most a few, whereas PMS 383 has dealt with six contractor and SUPSHIP organizations and one Naval Shipyard simultaneously, as shown below:

<u>Shipbuilder</u>	<u>SUPSHIP Loc.</u>	<u>Ship Type</u>	<u>No. of Ships</u>
Bethlehem Steel	Baltimore, Md.	AE	2
Ingalls	Pascagoula, Miss.	AE	4
National Steel	San Diego, Calif.	AFS	1
		LST	11
General Dynamics	Quincy, Mass.	AOR	4
		AS	2
		LSD	4
NNSDD Co.	New. News, Va.	LCC	1
Lockheed	Seattle, Wash.	LPD	3
Phila NSY	Philadelphia, Pa.	LCC	1

CASE 3 - A STUDY IN FIELD ORGANIZATION PROJECT MANAGEMENT
SUPERVISOR OF SHIPBUILDING, CONVERSION AND REPAIR,
UNITED STATES NAVY

The Supervisors of Shipbuilding, Conversion and Repair (SUPSHIP) organizations are under the cognizance of the Naval Ship Systems Command. Their responsibilities include the administration of Navy and other Department of Defense contracts for ship design, construction, conversion, outfitting, repair, alteration, inactivation and reactivation, planning, estimating and design function for Navy ship work in the contractor's plant, review and approval of contractor's plans, providing technical and engineering assistance, administering Quality Assurance programs, and arranging and overseeing performance during trials.

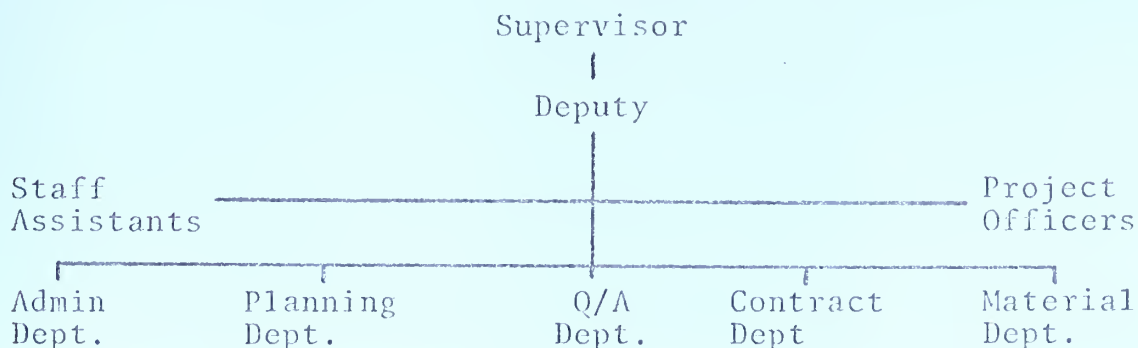
A typical large SUPSHIP organization is commanded by the Supervisor (RADM or CAPT/1400) and consists of approximately 30 military and four hundred civilian personnel. It is structured on a matrix basis with Project Offices established for the various ship programs, and Assistants to the Supervisor for Weapons and Aviation Systems, Management Information Systems Officer and Product Assurance Engineering Office reporting directly to the Supervisor. The department structure of the organization includes Administrative, Planning, Quality Assurance, Contract, and Material Departments.

Managers in a SUPSHIP organization stress the importance of field contract administration procedures, in addition to

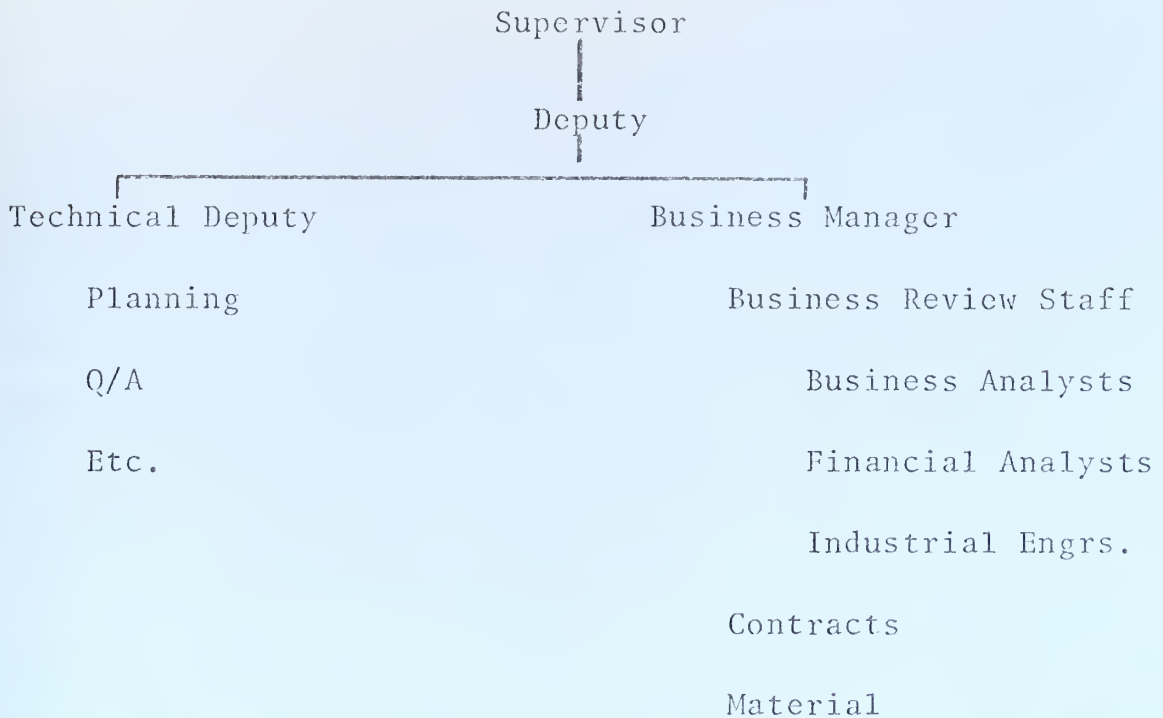
the other phases of procurement. There is also a necessity for developing an understanding and appreciation of the contractor viewpoint in approaching solutions to contract related problems.

The need for "business competence" and "better business practices" which is now being emphasized at the highest levels of Congress, DOD and Navy is an important issue in today's SUPSHIP organization. One of the proposed methods of upgrading our business posture is establishing Business Managers in the Project Offices and SUPSHIP organizations. There are several ways that a Business Manager can be established in a SUPSHIP and specific areas in which a business staff can apply their efforts. One approach is discussed below: The present organizational structure can be compared with a new format that could be used in establishing a Business Manager.

Present SUPSHIP Organization



Alternative SUPSHIP Organization*



*This format is not intended to represent the entire SUPSHIP organizational structure, but rather to present the relative organizational position of a Business Manager and his staff. This is only an alternative and is not intended to represent an officially recognized structure.

The primary purpose of a Business Review Staff would be that of providing a systems review of contractor activities, i.e., estimating, budgeting, financial control, cost accounting, material control and quality assurance systems; and efficient utilization of resources, including manpower planning and allocation, facilities utilization, etc. Visibility would be given to many areas that now seem to be resolved only through claims; such as implementing a Profitability System to clearly identify the profit picture

for each contract, and a Q/A System that would not rely solely on government inspection.

This approach to management could be highly controversial, in terms of contractor attitudes and funding to support the installation of these new management systems. If a contractor recognizes his inabilities to cope with costing, scheduling and control problems, etc., then working with him would be considerably easier than the situation where he feels his own systems are adequate and government requirements will only serve to disrupt his operations.

The success of establishing the concept as a way of doing business with a contractor has yet to be proven. This subject should present meaningful opportunities for further exploration by students in the SAM Curriculum.

CASE 4 - PROBLEMS IN FIELD CONTRACT ADMINISTRATION
SUPERVISOR OF SHIPBUILDING, CONVERSION AND REPAIR,
UNITED STATES NAVY

One of the concerns expressed by SUPSHIP managers is the interpretation of contract specifications and the resolve of problems associated with their interpretation. Two short problems are cited as example situations.

(1) Welding Specifications: The contractor was directed to use either ASME or ABS standards in performing a welding task. Certification for this work was to be accomplished in accordance with the applicable MILSTD. The matrix below shows the dilemma that resulted, simply because the MILSTD

did not specify the same procedures as either the ASME or ABS standard procedures.

<u>Procedure</u>	<u>MILSTD Rqmts.</u>	<u>ASME Stds.</u>	<u>ABS Stds.</u>
A	X		X
B	X	X	
C	X	X	X
D	X	X	
E		X	X
F			X

(2) Paint Specifications: A contract specification called for application of a preservative metallic base coat, then painting to a prescribed thickness. The specifications called for the base coat to be applied in greater thickness than called for in the NAVSHIPS Technical Manual. When paint was applied to the surface over the base coat, it peeled within 24 hours. This was an example of the specifications not being current with the "state-of-the-art" information contained in technical references. Had the specification not been so specific, the contractor would have done the right job in the first place.

A classroom exercise for studying this type of problem could be developed by having students read a given set of specifications. The class could be split into two groups, one interpreting the specs from a contractor viewpoint, and the other from the government viewpoint. Each group

would develop their own interpretations separately, then meet with the other group, compare notes and resolve differences.

BIBLIOGRAPHY

BOOKS

- Cleland, David I., and William R. King, Systems Analysis and Project Management, McGraw-Hill, 1968.
- English, J. Morley, Ed., Cost-Effectiveness: The Economic Analysis of Engineered Systems, Wiley, 1968.
- Hitch, Charles J. and Roland N. McKean, The Economics of Defense in the Nuclear Age, New York: Atheneum, 1965.
- Kline, M. B. and M. W. Lifson, Design: The Essence of Engineering, Los Angeles, University of California, April, 1968.
- Lifson, M. W., The Application of the Methodology of Design to the Design of a Course in Engineering Economics, Los Angeles, University of California, October, 1963.
- Peck, Merton J. and Frederic M. Scherer, The Weapons Acquisition Process: An Economic Analysis. Boston: Harvard, 1962.
- Proxmire, Senator William, Report from Wasteland, New York: Praeger Publishers, 1970.
- Steiner, George A. and W. A. Ryan, Industrial Project Management, Macmillan, 1968.
- Steiner, G. A. and W. G. Ryan, Managerial Methods of Successful Project Managers with a Loose Rein, Los Angeles, University of California at Los Angeles, 1965.
- The Acquisition of Weapons Systems, Hearings before the Subcommittee on Economy in Government of the Joint Economics Committee, Congress of the United States, Ninety-First Congress, First Session, Part 1, December 29, 30 and 31, 1969, U. S. Government Printing Office, 1970.
- The Acquisition of Weapons Systems, Hearings before the Subcommittee on Economy in Government of the Joint Economics Committee, Congress of the United States, Ninety-First Congress, Second Session, Part 2, May 20, 21 and 23, 1970, U. S. Government Printing Office, 1970.

The Acquisition of Weapons Systems, Hearings before the Subcommittee on Priorities and Economy in Government of the Joint Economics Committee, Congress of the United States, Ninety-Second Congress, First Session, Part 3, April 28 and 29, 1971, U. S. Government Printing Office, 1972.

The Acquisition of Weapons Systems, Hearings before the Subcommittee on Priorities and Economy in Government of the Joint Economics Committee, Congress of the United States, Ninety-Second Congress, First Session, Part 4, May 24 and 25, 1971, U. S. Government Printing Office, 1972.

Policy Changes in Weapon System Procurement, Hearings before a Subcommittee of the Committee on Government Operations, House of Representatives, Ninety-First Congress, Second Session, September 22, 23, 24, 29, and 30, 1970, U. S. Government Printing Office, 1970.

Policy Changes in Weapon System Procurement, Forty-Second Report by the Committee on Government Operations, U. S. Government Printing Office, 1970.

Weapon System Acquisition Process, Hearings before the Committee on Armed Services, United States Senate, Ninety-Second Congress, First Session, December 3, 6, 7, 8 and 9, 1971, U. S. Government Printing Office, 1972.

HANDBOOKS AND GUIDES

Air Force Institute of Technology 1969-1971 Catalog, Vol. III, No. 1, December 1969.

DSMC Policy Guidance Council Curriculum Committee, Proposed Defense Systems Management Center Five-Month Course Outline, 29 January 1971.

Intercollegiate Bibliography, Intercollegiate Case Clearing House, Harvard Graduate School of Business Administration, 1972.

U. S. Naval Postgraduate School, Catalogue for 1970-1972, Monterey, California, 1970.

LETTERS AND MEMORANDA

Bureau of Naval Personnel Letter Pers-C313-pjk Serial C313/92 to Superintendent, Naval Postgraduate School, Subject: Weapons Systems Acquisition Postgraduate Curriculum; establishment of as Curriculum #816, 28 January 1971.

Chief of Naval Material Memorandum for the Vice Chief of Naval Operations, Subject: Procurement/Weapons System Acquisition Officer Personnel Career Development, 8 October 1969.

Chief of Naval Material Letter MAT 011:RPC to Chief of Naval Operations, Subject: Career Development and Selection of Weapons Systems Acquisition Managers, 29 September 1970.

Chief of Naval Operations Memorandum Op-00;Dfb Op-00 Memo 335-69, to the Chief of Naval Personnel, Subject: Project Managers; training of, 2 December 1969.

Chief of Naval Operations Letter OP-102D/jd Serial 13118P10 to Chief of Naval Personnel, Subject: Career Development and Selection of Project Managers, 11 August 1970.

Chief of Naval Personnel Letter Pers Ag-snw to Chief of Naval Operations, Subject: Weapons Systems Acquisition/Procurement Management Study: Progress report of, 4 March 1970.

Deputy Secretary of Defense Memorandum for Secretaries of the Military Departments, Subject: Career Specialty in Development Project Management, 25 November 1969.

Freeman, R. G., III, Captain, USN, Letter to Dean Milton U. Clauser, Naval Postgraduate School, 27 January 1971.

Naval Air Systems Command Letter AIR-01A:FWA to Chief of Naval Material, Chief of Naval Personnel, Subject: Project Managers; training of, 24 March 1970.

Provost, Naval Postgraduate School Letter NC4(02)/ba to Members, Management Program Objectives Conference, Naval Postgraduate School, 13-15 January 1971, Subject: Report of Conference on Management Program Objectives, 10 March 1971.

Secretary of the Navy, Memorandum for the Deputy Secretary of Defense, Subject: Career Specialty in Development Project Management, 3 March 1970.

Superintendent, Naval Postgraduate School Letter NC4(36)/ec,
1200, Serial 1256.4 to Chief of Naval Personnel,
Subject: Weapons Systems Acquisition Postgraduate
Education Program; submission of, 20 July 1970.

OFFICIAL DIRECTIVES

Department of Defense Instruction 5000.1, Subject:
Acquisition of Major Defense Systems, 13 July 1971.

Secretary of the Navy Instruction 5000.1, Subject: System
Acquisition in the Department of the Navy, 13 March 1972.

REPORTS, ARTICLES AND THESES

Cleland, D. I., "Project Management: An Innovation in
Managerial Thought and Theory," Air University Review,
Vol. XVI, No. 2, January-February, 1965.

Halladay, M. E. and J. W. Murray, Weapons Systems Acquisition
Curriculum, Master's Thesis, Naval Postgraduate School,
Monterey, 1970.

Logistics Management Institute, Introduction to Program
Management, LMI TASK 69-28, March 1971.

Nace, W. J., Commander, USN, "Term Project Report - Systems
Acquisition Management," Naval Postgraduate School,
Monterey, 24 January 1972.

Parker, L. W., Jr., "A New Concept in Program Manager
Training," Defense Management Journal, Vol. VII,
p. 50-53, Fall 1971.

Perry, R. L. and others, System Acquisition Experience,
Santa Monica, California, the Rand Corporation,
Memorandum RM-6072-PR, November, 1969.

Staats, Elmer B., Comptroller General of the United States,
Report to Congress, Action Required to Improve DOD
Career Program for Procurement Personnel, 13 August 1970.

Staats, Elmer B., Comptroller General of the United States,
Acquisition of Major Weapon Systems, March 1971.

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The Systems Acquisition Management Curriculum offered by the Naval Postgraduate School is the first attempt by the Navy to provide naval officers with a graduate education in the fundamentals of systems acquisition. The methodology of design and development of this curriculum is described and analyzed. In the evaluation of this curriculum, alternative models are developed which provide the basis for continued curriculum improvement.

- Systems Acquisition
- Project Management
- Weapon Systems Acquisition
- Curriculum Development
- Curriculum Evaluation

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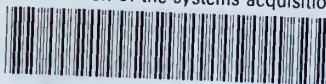
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